THE HAWAIIAN PLANTERS' MONTHLY

PUBLISHED FOR THE

HAWAIIAN SUGAR PLANTERS' ASSOCIATION

[Entered at the Post Office at Honolulu, T. H., as Second-class matter.]

VOL. XXVIII.] HONOLULU, JUNE 15, 1909. No. 6.

SUGAR PRICES MAY 14 TO JUNE 14, 1909.

Date.	96° Centrifugals per lb.	96° Centrifugals per ton	88° Beets per 100 wt.	88° Beets per ton
May 14	3.92¢	$78.40	10s 6¾d	$84.40
" 15	...	78.40	10s 7½d	84.80
" 19	3.95¢	79.00	10s 6¾d	84.40
" 20	3.95¢	79.00	10s 7½d	84.80
" 21	3.92¢	78.40	10s 7½d	84.40
" 22	3.92¢	78.40	10s 7½d	84.80
" 26	3.92¢	78.40	10s 8¼d	85.00
" 29	3.92¢	78.40	10s 8¼d	85.00
June 1	3.92¢	78.40	10s 7½d	84.80
" 3	3.89¢	77.80	10s 6¾d	84.40
" 4	3.92¢	78.40	10s 7½d	84.80
" 5	3.92¢	78.40	10s 6¾d	84.40
" 8	3.92¢	78.40	10s 7½d	84.80
" 10	3.92¢	78.40	10s 6¾d	84.40
" 12	3.89¢	77.80	10s 6d	84.20
" 14	3.92¢	78.40	10s 6d	84.20

THE SUGAR MARKET.

Otto Licht's final estimate of European beet sowings for 1908-09 are 1,775,582. His first figures were 1,773,304.

His estimate of sowings for 1909-10 is 1,806,199 hectares, an increase of 30,617 hectares, or 1.7 per cent.

The consumption of sugar in Europe from Sept. 1 to March 31, was 2,509,000 tons, against 2,391,000 tons for the previous year, a net increase of 118,000 tons.

Willet and Gray report the total stocks in all principal ports at latest uneven dates as of approximately May 1, was 2,792,130 tons, as against 2,743,145 tons last year; an increase of 48,985 tons.

On June 6, latest uneven dates, total stock of Europe and America was 2,771,483 tons against 2,739,857 tons last year at same uneven dates, an increase of 31,626 tons as against an increase of 48,985 tons last week.

The total visible supply, ashore and afloat, is 2,876,483 tons, an increase of only 11,626 tons, same date last year.

The visible production of Cuba to June 3, 1908, is 1,344,000 tons. With sugar still on plantations, in transit and the balance of output of eleven centrals still grinding, the total crop is estimated by Willet & Gray at 1,400,000, with possibility of its increasing to 1,450,000 tons.

The weather in Louisiana, Cuba and Porto Rico and the beet-producing states of the United States is reported to be excellent, the weather being warm and rainy.

San Francisco reports, May 28, that with the approach of the fruit canning season the demand for refined is improving.

Texas is joining the cane sugar producers. Two new companies were organized in May; one with a capital of $1,000,000 and the other with a capital of $500,000.

Willett & Gray's estimate of the wold's production of sugar for the three years ending 1909 is as follows:

	1908.09.	1907-08.	1906-07.
Total cane sugar crops (W. G.)	7,417,854	6,889,360	7,329,317
Crope beet sugar crops (F. O. Licht)—September	6,502,000	6,562,274	6,710,808
United States beet sugar crops (W. & G.)—July and Oct.	384,010	440,200	433,010
Grand total cane and beet sugar—Tons	14,303,864	13,891,834	14,473,135
Estimated increase in the world's production—Tons..	412,030	.....	.....

FRANCE, May 19, 1909.—The weather has been abnormally dry and cool with some frosts reported. Towards the close the weather became warmer, and this condition was well received by the cultivators, as the cereals and the beet roots were commencing to feel the effects of the cold dry weather.

GERMANY, May 14, 1909.—The weather during the greater part of the week was cold and dry with some frosts reported. Field work has been progressing normally but the dryness and the cold weather has seriously interfered with the sprouting of the beet seed, so that the conditions of the crop are considerably backward compared with a normal year.

AUSTRIA, May 19, 1909.—During the first part of the week the weather was cool, but later became sunny and warm. Although the beets in some sections have been hoed, however, the stand of

the beets in general is very unfavorable. In Selicia a part of the beets have only just sprouted. In Moravia and Hungary the growth of the beets is much hindered by ravages of insect pests.

SAN JACINTO, CAL.—The San Jacinto Sugar Company or the Columbia Land and Sugar Company proposes to erect a beet sugar factory at San Jacinto, California, and some $800,000 has been subscribed.

Although it is not known when work will be commenced it is proposed to have it ready to slice beets in 1911.

San Jacinto is located near Perris, between Redlands and the coast, in Southern California, and has an elevation of about 2,000 feet.

The company will use the dry farming process, especially in the uplands.

EDITORIAL NOTES.

Some of the great irrigation projects of the U. S. Government, which have been in course of construction for the past several years, are now approaching completion. One of the greatest of these is the confining of the flood waters of the North Platte River, by the great "Pathfinder Dam," by means of which the heretofore disastrous spring floods will be stored in a reservoir which will hold 1,025,000 acre feet; i. e., the equivalent of 1,025,000 acres one foot deep. It is estimated that the stored water, which would otherwise be wasted, will suffice to irrigate 400,000 acres of land in Wyoming and Nebraska. It is also of interest to note that the area of homesteads will be limited to 80 acres each, and that homesteads will have to pay for the cost of the irrigation works, in ten annual installments, at the rate of $45 per acre.

Senator Elihu Root of New York has joined the ranks of the tree planters. "Conservation" reports that during 1909 he has planted 64,000 trees in Oneida Co., New York.

The people of the United States are certainly awakening from the lethargy upon the subject of preservation and increase of forests. The Pennsylvania Railroad has come to the front as the champion tree planter, having set out 3,430,000 trees during the last three years. We print elsewhere the details of what this one company is doing. The breadth of the company's forest policy is indicated by the fact that it is furnishing young trees for planting, to all comers, at cost. This policy is worthy of imitation in Hawaii

The National Irrigation Congress meets at Spokane, Washington, August 9 to 14 next. President Taft and several members of the Cabinet, a number of U. S. Senators and leading en-

gineers and authorities and 4,500 delegates from all parts of the world will be present. Hawaii is entitled to representation and should not neglect the opportunity to let the world know that she is on the map of the world and knows a thing or two about irrigation.

Dry land farming is attracting more and more attention in the United States, where the "Great American Desert" of a few years ago is now yielding larger crops than the average "good farming land" of the wetter sections of the country.

The secret of "dry farming" is deep plowing and continued stirring of the soil, which prevents evaporation of the water in the subsoil.

Experiments at dry land farming are being carried on in several places in these islands, notably at the Parker Ranch on Hawaii, and by A. W. Van Valkenberg near Leilehua on this island.

Notice of a "Dry Farming Congress" to be held in Montana in October next, is published herewith.

The advertising campaign of the Hawaiian pineapple growers has put "Hawaii on the map" to thousands of people. The campaign has so associated the words "Hawaii" and "Pineapple," that when one is mentioned the other will be thought of by thousands who never before thought much of either. By reason of the campaign, Hawaiian pineapples and the enterprise of the pineapple growers are being given free mention in publications in every part of the globe. Keep the good work going.

A DISEASE RESISTING CANE.

Elsewhere herewith is printed some extracts from U. S. Consular Report on the sugar industry in Natal. It is somewhat amusing to read of mills giving 65 per cent. extraction, although it is only about twenty years ago that Hawaii was reporting similar figures from its best mills. An item which may well make Hawaii sit up and take notice, however, is the statement that after the principal cane in use had been destroyed by a smut, a new cane with a sucrose content of 18.61 and a purity of 91.6° was introduced, which is "hardy, bears frost and drought, stools prolifically, recovers readily from locust attacks, is subject to no fungus pests and is but little damaged by white ants and borer."

Several of the qualities named are highly desirable, more particularly its ability to withstand fungus. The fact that it is hardy and withstands frost and drought would make it a most valuable cane for the highland portions of the non-irrigated Hawaii plantations, if the cane proved adaptable to that soil and climate.

We suggest that it would be entirely feasible to secure through the American Consul at Natal a sample of this cane in a wardian case, which could be forwarded to Honolulu via Capetown and

Australia by the regular lines of steamers plying between those points. By having the importation made through the Experiment Station, all danger of introducing pests and diseases would be eliminated by thorough inspection, disinfection and quarantine. The cane might not prove adaptable to Hawaii, but in view of the history of the past, a constant lookout should be kept for new varieties of cane. If Yellow Caledonia had not been experimentally introduced some years ago a number of the most profitable plantations on these islands would be out of business today.

The whole world is waking up to the necessity of forest planting.

The Royal Commission on Coast Erosion and Afforestation of Great Britain, has recently reported that in the United Kingdom there are about 9,000,000 acres suitable for afforestation, and they suggest that about 150,000 acres should be planted up annually. They estimate that the return obtained in course of time would be sufficient to repay both capital and accumulated interest.

A remarkable method of eradicating plant diseases was recently developed in the Island of Montserrat, in the West Indies. The cotton industry of the island was threatened by numerous plant diseases, which were passed on from one generation of plants to another. It was finally agreed between all of the cotton planters that on a given date every cotton plant on the island should be dug up and burned. This was done, and a new start made with new seed. As a result of this system of working, the highest average return of cotton yield in any portion of the West Indies during the 1907-8 season was obtained at Montserrat.

Hawaii has become the world's object lesson in connection with cane irrigation. In the May Planters' Monthly we gave extracts from Professor Crawley's report on cane irrigation in Cuba, which consisted largely in stating what was being done in that line in Hawaii. And now comes the "Porto Rico Horticultural News" and says that "the Santa Isabel Sugar Co. have been using the system of irrigation introduced into Porto Rico by Mr. P. McLane, general manager of the Aguirre Co., with great success. Mr. McLane's system is probably by long odds the best irrigation system ever used in this Island."

Mr. McLane was for years a plantation manager in Hawaii, having recently gone to Porto Rico.

The growing appreciation of agricultural colleges and experiment stations is shown by the fact that the Washington State Legislature, just adjourned, appropriated to the college and station for the ensuing biennium $487,256 for maintenance, general improvement, equipment, and experimental and extension work;

$17,500 for farmers' institutes, and $29,600 for the Puyallup Substation.

The extraction of atmospheric nitrogen for fertilizer purposes has passed beyond the experimental and entered the commercial stage. In addition to the great plant in Norway, noted elsewhere, the Frank and Saro process is now in practical use, a number of new works being established to employ the process. Works are being constructed on the Canadian side of Niagara Falls with a capacity of from 5,000 to 6,000 tons per annum, which it is hoped to enlarge later on so as to produce 40,000 tons. Is it not about time for some of our owners of water power on Kauai, Maui and Hawaii to be getting figures for a plant to furnish Hawaii with home made nitrates?

SHOULD CANE BE STRIPPED OR NOT?

A cane stripping experiment in Formosa proved that stripping decreased the sucrose, lowered the purity and increased the glucose and fiber content of the cane. That stripping does no good has been shown by all the experiments made, while a number of them indicate that it is positively injurious to the cane. As quite a number of managers in Hawaii continue to strip, a pertinent inquiry is, "why do they do it?" We shall be glad to receive a defense of stripping, for the question is a vital one to the sugar industry in Hawaii.

A system of insurance of crops against hurricanes has been initiated in the West Indies. The premium is two per cent. per annum. Hawaii suffers from many kinds of pestiferous bugs, but hurricanes are not among the number. We have some things to be thankful for, even if we do have leaf hoppers and strikes.

Bulletin No. 9 of the Division of Pathology and Physiology of the Planters' Experiment Station, is one of the most practical and valuable that has come from the Station. It deals with the deterioration of sugar in storage and in transit; shows what causes the loss and what must be done to avoid it. The loss in question is one which has been serious on many plantations, amounting in the aggregate to thousands of dollars per annum. Every manager, sugar boiler and chemist on the plantations should study this Bulletin.

The United States Government has had to adopt drastic measures with the government of Porto Rico. The elected representatives of the people refused to vote appropriations for the expenses of the government until the local government was given more power. As a result Congress, at the present special session, has passed a law authorizing the Governor and Treasurer of Porto

Rico to appropriate funds to carry on the government, using the last appropriation bill as a basis.

The last act of the Philippine Legislature was to pass a resolution demanding immediate and complete independence.

Hawaii is steadily progressing, with no more troubles than are incident to the government of many of the States; maintaining the peace; paying its own way and paying into the Treasury at Washington, over $1,000,000 a year more than all of the local expenses of the Federal Government. It is an intelligent, progressive, American community.

In the face of all this, there are those who think that Porto Rico, the Philippines and Hawaii ought to all be given the same form of government and be classed as "Possessions."

SHOULD CANE BE STRIPPED?

The most vital subject now before the sugar fraternity of Hawaii is the devising of ways and means of producing sugar with a minimum number of laborers.

The most disagreeable work on a sugar plantation is stripping cane. It is also one of the items on a plantation which calls for a large amount of hand labor.

The question of whether or not cane stripping is advantageous or otherwise has been an active one before the sugar planters for several years.

The Alexander & Baldwin plantations some time ago came to the conclusion that stripping the cane was a useless expenditure.

Some three or four years ago the Planters' Experiment Station tested the question at the station in Honolulu with several plats of land, some stripped and some unstripped, resulting in a demonstration, not only that the stripping did no good but that it worked a positive injury to the cane, the stripped plats producing less cane and of inferior quality than did the unstripped ones.

The results being questioned, the experiment was tried over again and the results of the second experiment were made public in 1908, being almost identical with those of the first experiment.

It was argued by some of the planters that the results obtained by the experiment station might be sound for plantations situated in dry weather, irrigated districts, but did not apply to the wet districts; the argument being used that in cloudy and wet sections it was necessary to let the light and air in to ripen up the cane; and further, that stripping was necessary to prevent the starting of roots at the base of the leaves at the joints of the cane, where the moisture collected, as the roots decreased the amount of sucrose in the cane.

The reasoning appeared logical, but the Hakalau plantation management decided to test the theory and accordingly made a similar experiment to that conducted at the Honolulu Experiment

Station, on its plantation at Hakalau, Hilo, Hawaii, where the rainfall is in the neighborhood of 200 inches a year.

The results of the Hakalau experiment were published last year. They were not as striking as those at the Honolulu Station, but they showed that no benefit was derived from the stripping of the cane, while the plantation was out the cost of the stripping. This experiment was on such a small scale, however, that it was still inconclusive to some planters.

In order to ascertain what the results would be on a commercial scale, the Olaa Sugar Company decided to make an experiment which it did on 215 acres of Yellow Caledonia cane which had been planted in June, 1907, in a field lying just mauka of the mill, at an elevation of from 250 to 300 feet, at a point where the rainfall is about 180 inches a year.

In order to get fair average results the entire field was divided into alternate sections of twenty rows each; each alternative section being stripped, the remaining sections being left unstripped. Careful measurements, weights, analysis and statistics of expense were kept.

Manager John Watt has just made his report upon the matter, which is published in full herewith. In his conclusion he says: "From a general consideration of all the data given above I believe it can safely be stated that in no way was the quality of cane improved by stripping."

One of the series of experiments conducted was to compare the analysis of unrooted cane with an equal amount of cane which was thickly rooted at the joints. Strange to say the cane on which roots had grown showed a higher percentage of brix, sucrose and purity than did the cane on which there were no roots. One of the main reasons given for stripping was shown not to exist at all.

Mr. Watt's summary is to the effect that after taking everything into consideration there was a difference in favor of unstripped cane as against stripped cane of 11½ cents per ton of cane. Allowing 8 tons of cane to a ton of sugar, would give a difference of 92 cents a ton of sugar in favor of the non-stripping of cane. The results obtained by the Experiment Station in Honolulu showed a much greater margin in favor of non-stripping than did the Olaa experiment; but even at the rate of saving shown in the latter case the saving on the total Hawaiian crop of 1908 would have been close to $500.000.

So far as we know most of the island plantations are still stripping their cane. We suggest that the experiments already made demonstrate enough to warrant every plantation on the islands which is still stripping, immediately experimenting for itself, upon a commercial scale, to ascertain whether or not stripping is not only a useless expense but a detriment to the quantity and quality of the cane.

If no more is ascertained than that the cane is not improved by stripping, the labor situation will be relieved to the extent which laborers who would otherwise be stripping become available to do other work, and this must be at least the equivalent of 2,500 to 3,000 men on all of the plantations.

The Planters' Monthly earnestly urges that this stripping question be immediately and accurately tested and that the opinions of practical planters, pro and con, and results of experiments made may be furnished to the Planters' Monthly for publication for mutual benefit.

A CANE STRIPPING EXPERIMENT AT OLAA PLANTATION.

The object of this experiment was to determine, if possible, the effect of stripping the cane, as practiced on the plantation, on the yield of sugar and the probable gain or loss resulting from same.

The field selected for this purpose contained 215 acres of Yellow Caledonia plant cane, which had been planted in June, 1907. The planting, cultivation and fertilization of this cane was exactly the same as carried out on the plantation. The cane was left unstripped until September, 1908, when half of the field was stripped and the other half left unstripped. To get as uniform results as possible, the stripping was done in sections of twenty rows, alternating with a similar section of unstripped cane.

The harvesting of the field began on March 5th and continued until May 28th. During that time it was necessary to stop work in the field to harvest other fields—this consequently divided the time of harvesting into two periods. The first period extending from March 5th until March 18th, and the second from May 14th until May 28th.

At different times, during the periods of harvesting, analyses were made by Mr. Giacometti to determine the relative purity and sucrose content of juice from stripped and unstripped cane, and, as one of the chief objects in stripping the cane is to get purer and richer juice, it was thought best in taking the samples to take only canes which were typical of each section, hoping in this manner to obtain some definite idea of the merit of stripping.

In the following analyses, each sample consisted of five canes taken from adjoining sections—stripped and unstripped—and, with a few exceptions, represented cane which grew practically under similar conditions:

ANALYSIS OF CANE.

	STRIPPED.		NOT STRIPPED.	
	Brix.	Purity.	Brix.	Purity.
March 5	20.0	93.5	19.20	89.0
" 5	18.83	92.9	18.23	90.5
" 5	19.73	93.0	18.23	89.9
" 5	19.30	93.5	18.44	92.1
" 6	19.0	91.0	18.70	92.0
" 6	18.54	91.6	18.4	89.6
" 8	20.2	92.6	19.7	92.8
" 8	20.2	92.6	19.7	92.8
" 8	19.97	93.5	20.07	93.1
" 10	19.94	93.2	19.97	92.6
" 10	20.40	93.6	20.10	93.2
" 10	20.34	92.1	19.81	92.7
" 10	20.14	92.3	19.84	93.2
" 11	19.27	93.4	20.01	92.1
" 12	19.64	92.9	19.54	93.4
" 12	19.98	91.6	19.58	92.4
" 13	19.64	93.1	19.74	92.2
" 13	19.84	93.2	19.84	93.2
" 13	20.54	93.5	19.64	93.7
" 13	20.14	92.3	20.34	92.1
April 21	19.68	94.0	19.78	93.5
" 21	19.45	93.5	19.95	93.9
" 21	19.65	92.8	19.65	93.6
" 22	20.40	93.1	20.4	92.6
" 22	20.50	95.6	20.00	93.2
" 23	20.04	93.0	20.54	93.7
" 23	19.74	93.7	20.74	94.5
" 23	20.90	92.8	20.60	94.1
" 24	19.84	93.5	20.2	91.5
" 24	20.70	92.9	20.80	93.0
May 17	20.04	91.5	19.94	91.5
" 17	20.52	92.3	20.62	92.1
" 17	20.42	91.00	20.42	92.0
" 18	19.94	91.2	20.24	92.6
" 18	20.20	91.1	20.30	91.1
" 18	20.38	92.0	19.18	93.3
" 18	20.10	92.0	20.50	92.6
" 20	20.33	91.7	20.33	92.4
" 21	20.73	91.6	20.93	93.1
" 21	20.85	92.13	20.85	92.00
" 21	21.18	91.3	21.45	90.4
Average	20.05	92.6	19.91	92.5

From the above analyses it is quite clear that there can be but very little difference, even in the extremes, in the purity and sucrose content of the two canes. The small difference in favor of the stripped cane is mostly due to the fact that the first few samples, in the unstripped series, were taken from a very low place, where the cane was green and the tonnage exceeded, by far, that of the unstripped section, where the samples for the other series were taken. The above should be taken into consideration in drawing conclusions.

COMPARISON OF ROOTED WITH NON-ROOTED CANE.

The formation of roots along the stalk is one of the chief objections to not stripping. As these roots are supposed to have an injurious effect on the juice, a series of analyses were made to obtain some data on this point. Following is given two sets of analyses:

One from cane which was badly rooted, and the other from cane not rooted. Each set of samples was taken from adjoining rows in the stripped and unstripped sections, within a few feet of ach other, and, therefore, represents cane growing in a similar soil under similar conditions. Five canes were used for each analysis, and in all cases the cane taken from the unstripped sections were the very worst that could be found, so far as the development of roots along the stalk was concerned:

	NOT ROOTED.			ROOTED.		
	Brix.	Sucrose.	Purity.	Brix.	Sucrose.	Purity.
	19.84	18.65	93.5	20.2	19.1	91.5
	20.70	19.25	92.9	20.8	19.35	93.0
	20.04	18.35	91.5	19.94	18.25	91.5
	20.52	18.95	92.3	20.62	19.00	92.1
	20.42	18.60	91.0	20.42	18.80	92.00
	19.94	18.20	91.2	20.24	18.75	92.6
	20.20	18.70	91.1	20.30	18.50	91.1
	20.38	18.75	92.0	19.18	17.90	93.3
	20.10	18.50	92.0	20.50	19.00	92.6
	20.33	18.65	91.7	20.33	18.80	92.4
	20.73	19.00	91.6	20.93	19.50	93.1
	20.85	19.25	92.1	20.85	19.20	92.00
	21.18	19.35	91.3	21.45	....	90.4
Average	20.4	18.74	91.8	20.43	18.88	92.1

From these analyses it would appear that the development of roots, along the stalk, has very little injurious effect, if any, on the sugar content and purity of the juice; in fact, the average for the rooted cane is above that of the unrooted cane.

COMPARISONS OF FIBRE CONTENT.

Several fibre determinations were made of typical stripped and unstripped cane. The samples for the analyses were taken in the same manner as in the above experiment, care being taken to take cane equal, as much as possible, in weight and size. Below is given the total weight of cane used, amount of juice obtained from small hand mill, and average analyses from five samples, consisting of five canes each:

	Stripped.	Unstripped.
Weight of cane (gms)	33.016	32.954
Weight of juice	16,624	16,655
Per cent. of extraction	50.3	50.5
Fiber in cane	15.21	13.79
Sucrose in cane	14.62	14.80

In these analyses the fiber in the unstripped cane was considerably less in all cases than in the stripped cane, showing that stripping the cane has a general tendency to harden and make the cane more fiberous.

From a general consideration of all the data given above, I believe it can safely be stated that in no way was the quality of cane improved by stripping.

QUANTITY AND COST PER ACRE.

The next questions, which are of equal importance as to quality of cane, are: Quantity per acre and cost of production. To obtain data on these two points, two parallel sections, over 3500 feet long, consisting of twenty rows each of stripped and unstripped cane, were harvested separately. On the first day, twenty men working in the unstripped cane cut, from 5:45 a. m. to 2:15 p. m., 61.12 tons. The same number of men working in the stripped cane cut, from 5:45 a. m. to 1:00 p. m., 43.32 tons. The wet trash from 21.59 tons of unstripped cane amounted to .980 tons or 4.53%. The trash from 16.6 tons of stripped cane amounted to 2.65 tons or 1.51%. On the second day the men were interchanged—the men working on unstripped sections the first day worked on the stripped cane the second day, and vice versa. In this experiment no attempt was made to clean the cane, and the per cent. trash on the cane is, therefore, about the most that can be carried to the mill under similar conditions.

The following analyses give the result obtained for the two days' work:

	Stripped.	Unstripped.
Brix	19.90	19.98
Sucrose	18.36	18.29
Purity	92.3	91.60
Area cut	4.17	3.67
Tons cane (less trash)	122.26	123.29
Tons cane per acre	29.31	33.59
Men working (ten hours)	33.5	36.0
Tons cane per man	3.65	3.42
Per cent trash (wet)	1.42	4.06
Per cent. trash (dried)	.49	1.64
Dead cane per acre	748.0	1160.0
Cost per ton cutting	20.5¢	21.9¢
Cost per ton stripping at $4.50 per acre	15.3¢	....
Total cost per ton of cane	35.8¢	21.9¢

As could be expected, the men working on the unstripped section cut less cane than the men working on the stripped section, and the amount of trash carried to the mill in the stripped cane was less than in the unstripped cane. The extra amount of trash would tend to lower the extraction and reduce the efficiency of the mill.

To see what would be the extra labor required for cutting the

cane and removing the extra trash, while cutting, the above experiment was repeated, with the following results:

	Stripped.	Unstripped.
Brix	20.10	19.98
Sucrose	18.65	18.56
Purity	92.8	92.90
Area cut	3.94	3.61
Tons cane cut	144.68	133.82
Men working (10 hours)	38.0	40.0
Cane cut per man	3.81	3.34
Per cent. dry trash	.42	.51
Dead cane per acre	639.	980.
Cost per ton cutting	19.7¢	22.7¢
Cost per ton stripping	12.2¢	....
Total cost per ton	31.9¢	22.7¢

From this we see that the men working in the stripped cane cut, on an average, per day, about half a ton of cane more than the men working in the unstripped section. The cost of cutting .5 tons of cane would, therefore, represent the extra cost of preparing the unstripped cane for the mill. This amount is in itself a variable quantity and its value depends on several factors. However, as the same factors directly influence the cost of stripping, the relative gain or loss from this source should remain approximately the same.

AMOUNT OF DEAD CANE.

The number of dead canes was comparatively low, with a slightly larger quantity per acre in the unstripped sections. This, however, was mostly due to the fact that, during stripping, a certain number of dead canes were removed from the stripped sections, which is not included in the above. The percentage of sucrose was approximately the same in both cases.

The quantity of cane obtained was on an average 2.40 tons more per acre in the unstripped cane than in the stripped cane. This amount, more per acre, though small when we consider the many difficulties arising in obtaining accurate data as to weight, should not be altogether neglected in drawing final conclusions. Such increase in weight has already been pointed out by the Experimental Station on irrigated plantations, and, therefore, should only serve to point out the possibility of such increase in non-irrigated plantations.

CONDENSED RESULTS OF THE EXPERIMENT.

The field used for this purpose was planted in Yellow Caledonia cane in June, 1907. The planting, cultivation and fertilization of this cane was exactly the same as carried out elsewhere on the plantation. The cane was left unstripped until September, 1908, when half of the cane was stripped and the other left unstripped.

To get as uniform results as possible the stripping was done in sections of twenty rows, alternating with a similar section of unstripped cane. The harvesting of the cane began in March, 1909.

The area included in the experiment was 215 acres.

Below is given in a condensed form, some of the data obtained:

	Stripped.	Unstripped.
Brix (average 41 analyses)	20.05	19.91
Sucrose	18.56	18.41
Purity	92.6	92.5
Area cut (acres)	8.11	7.28
Tons cane cut	266.94	257.11
Tons cane cut per acre	32.9	35.3
Men working 10 hours	71.5	76.0
Tons cane cut per man per day	3.73	3.38
Dry trash per cent. cane	.45	1.07
Cost cutting per ton cane	20.1¢	22.2¢
Cost stripping per ton cane	13.6¢	....
Total cost per ton cane	33.7¢	22.2¢
Difference in cost per ton cane in favor of Unstripped	....	11.5¢

AVERAGE ANALYSES OF ROOTED AND UNROOTED CANE.

(13 samples of each.)	Non-Rooted.	Rooted.
Juice:		
Brix	20.4	20.43
Sucrose	18.74	18.88
Purity	91.8	92.1

CANE STRIPPING IN FORMOSA.

Results of experiments in the stripping of sugar cane in Formosa indicate that this method of treatment for imported canes causes a decrease in sucrose together with a lowering of the purity coefficient, while at the same time the glucose and fiber are increased. This the author interprets as due to a chemical activity by which the nonsucrose is transformed into sucrose and sucrose into glucose. This chemical activity may be influenced by the presence of a large amount of salt absorbed with the water. The fresh food material thus obtained is expended in the growth of all canes except the colored canes.

A long exposure to the hot sun was found to increase the fiber content, but exceptions to this rule were the Formosan varieties and the Striped Singapore, which are all rather hard in rind. Different kinds of manures applied did not seem to affect the results. The juice obtained from all canes from which the dry leaves were not stripped was slightly higher in sucrose content and coefficient of purity than the juice from the stripped canes. Rose Bamboo has proved a very promising cane. The results secured with this variety show that by stripping 4,445.76 pounds per acre of cane were gained but 229.68 pounds of sugar were lost.

SUGAR IN NATAL.

The Natal Agricultural Journal publishes an account of the status of the cane sugar industry in that colony, which shows that South East Africa has similar problems to those of Hawaii, some of which they are meeting, and that in other respects they are away behind the times.

As Lahaina cane has been driven out of the wet districts of the Island of Hawaii, by a root fungus, so the cane chiefly raised in Natal suddenly succumbed, we are informed, to a species of smut, and had to be discarded. This led to the trying of a large number of varieties of cane, all of which have been discarded in favor of a variety known as "Uba," a name, it is said, formed of the only letters remaining legible on a damaged label attached to the variety on its arrival in the country. It is thought to have come from India. From a milling point of view, this cane is undesirable; it is thin, tough, wiry and fibrous, and the juice needs special treatment; mill managers say that from 10 to 30 per cent. more mill power is required for this cane than for any other variety. But the planters like it, since it endures the uncertainty of the Natal climate better than any other variety yet tried; it is hardy, bears frost and drouth, stools prolifically, recovers readily from locust attacks, is subject to no fungus pests, and but little damaged by white ants and the borer. It is successfully grown on the highlands of the interior as forage for cattle.

ANALYSIS OF UBA CANE.

	Average.	Maximum.
Total solids in juice (per cent.)	20.32	22.79
Sucrose (per cent.)	18.61	20.79
Glucose (per cent.)	.18	.27
Non-sugars (per cent.)	1.53	1.73
Glucose ratio	1.00	1.30
Purity	91.6°	91.2°
Per cent. of juice in cane	84.28	82.30
Per cent. of fiber in cane	15.72	17.70

This analysis shows a cane of high quality, but there is something radically wrong with the milling machinery, for the information is given that only 65 per cent. of juice is obtained from Uba cane. The mill is said to consist of two three-roll mills.

It is stated that "it takes variously from 12 to 20 tons of Uba cane to produce one ton of crystals. A first-class factory has been known to obtain one ton of crystals from 12½ tons of Uba cane as a season's average; that is to say, every 100 tons of cane produced 8 tons of crystals. These crystals, of course, would not be pure sugar; they would probably contain 7⅔ tons pure sugar. Assuming the cane to have contained originally 13½ per

cent. of sugar, there would have been obtained 13½ tons of pure sugar from 100 tons of cane had it all been extracted. What then became of the balance? In the absence of systematic chemical examination, it is impossible to say, but probably 3 1/5 tons passed away in the megass and were burnt, ⅓ ton was lost in the filter residues and waste waters, and 2⅓ passed away in the molasses. The latter is not lost, as there is a good market amongst the natives for molasses. At the small mills worked by the planters themselves, it very likely requires as an average 16 tons of Uba to produce one ton of crystals. With other canes, a good factory has been known to produce one ton of crystals from less than 11½ tons of cane as a season's average."

It sounds odd, in this land of 95 per cent. extraction by 12 roll mills, and discarded diffusion plants, to see the grave statement that "the most serious loss at the large factories is in the megass, and the only known way of preventing this is by the adoption of the diffusion process."

BACTERIAL FLORA OF HAWAIIAN SUGARS.

The H. S. P. A. Experiment Station has published since our last issue, Bulletin No. 9, of the Division of Pathology and Physiology, containing 36 pages, on the "Bacterial Flora of Hawaiian Sugars," by L. Lewton-Brain and Noël Deerr.

The immediate cause of the investigation, the results of which are set forth in the Bulletin, was the deterioration of sugars in storage, and more particularly during the long voyage to New York. Efforts have long been made to ascertain the cause of this deterioration, with a view to finding a remedy. The Bulletin in question contains a detailed account of extensive studies of bacilli cultures in different media, the conclusion being that the loss is caused by bacteria which develop in insufficiently dried sugars. There is practically no deterioration in sugars containing less than 1% of moisture. The remedies suggested are the greatest possible cleanliness about the mill and factory, so as t eliminate the points of infection, and drying sugar to a point below 1%.

The Bulletin contains 21 sketches and half tone pictures : many statistical tables. Further experiments are to be carried on in individual sugar factories to ascertain the best practical means of minimizing the losses from this source.

The following extracts are made from the Bulletin, which show its general scope and conclusions:

"The fall in polarization of sugars in storage, and especially in transit on the voyage from Honolulu to New York round Cape Horn, has formed a subject of discussion for the last ten or fifteen years, and is, on its merits, one of great importance and deserving of detailed study, since very considerable sums of money may be annually lost to the producers on this account.

U. S. WEATHER BUREAU, APRIL, 1909
CLIMATOLOGICAL REPORT: HAWAIIAN SECTION

WILLIAM B. STOCKMAN, Section Director.

			Temperature in degrees F.						Precipitation in inches.				Sky.				
Insane Asylum	Honolulu	30	71.0	83	21	53	5	24	17	2.18	— 0.35	1.04	11	24	6	0	NE	E. Abrehamsen
Kahuku	Koolauloa	25	70.0	85	26	54	‡ 5	23	19	1.89	— 0.21	0.32	22	13	7	10	NE	R. T. Christophersen
Maunawili Ranch	Koolaupoko	259	70.3	83	‡ 20	54	5	24	15	7.97	+ 1.49	2.18	22	12	4	12		John Herd
Tantalus Heights	Honolulu	1300	66.8	77	‡ 16	56	‡ 3	18	2	5.62		2.72	19					W. M. Giffard
U. S. Magnetic Station	Ewa	45	71.8	84	‡ 23	55	5	23	8	0.70		0.31	7	4	20	6	S	Wm. F. Wallis
Waiawa	Waialua	870	67.6	81	‡ 9	47	5	28	9	3.28		1.54	15				NE	Henry C. Brown
Waialua Mill	Waialua	30	70.6	87	27	58	‡ 4	26	9	0.94		0.24	8	10	11	9	NE	W. W. Goodale
Waialua (Opaeula)	Waialua	1100	67.5	80	‡ 9	50	‡ 4	23	5	3.62		1.79	12	15	5	10	NE	W.W. Goodale
Waianae	Waianae	6	72.7	85	‡ 22	54	4	23	‖ 17	2.17	+ 1.46	0.70	9					Fred Meyer
Waiawa	Ewa	675		81	‡ 13				5	1.85		0.57	17	24	5	1	NE	A. Lister
Island of Kauai.																		
Kealia (d)††	Kawaihau	15	71.0	85	? 26	54	? 5	24	10	2.30	+ 0.23	0.60	8	17	13	0	NE	Makee Sugar Co.
Kilauea	Hanalei	342	70.6	84	26	53	4	26	24	2.85	— 2.15	0.80	10	14	5	11	E	L. B. Boreiko
Koloa	Koloa	241	70.7	82	26	53	6	24	‖ 22	5.61	+ 1.38	3.09	15	21	0	9	NE	Koloa Sugar Co
Lihue	Lihue	200	68.8	82	25	51	‡ 4	27	5	2.42		1.23	13	17	5	8	N	F. Weber
Makaweli	Waimea	140	72.1	82	29	56	4	22	14	2.12	+ 1.48	1.32	7	16	3	11	E	Hawaiian Sugar Co
Mana Pump	Waimea	30	72.4	87	9	53	4	26	5	0.83		0.52	4	19	3	8	N	W. Danford
Island of Molokai.																		
Kalawao	Kalawao	70	‡72.4	‡93	27	59	3	30	5	7.63		2.28	12	25	0	5	SE	Father Emmeran
Mapulehu Ranch	Molokai	75	71.8	83	‡ 18	60	‡ 3	19	3	3.33		2.21	11	15	9	6	NE	C. C. Conradt
Molokai Ranch	Molokai	800				‡‡54	‡ 4		10	2.50	+ 0.10	1.07	14	4	18	8	NE	G. P. Cooke

A letter of the alphabet, following the name of a station, indicates the number of days missing from the month's report: (a) 1 day missing; (b) 2 days missing, etc.

All records are used in determining Island means, but the mean departures from normal precipitation are based only on records from stations that have ten or more years observation; the record of the current month is included in the computation of rainfall normals. ‡ More than one day. ‖ Not consecutive ? Private equipment.

†† Precipitation a full month's record. ‡‡ For 28 days.

U. S. WEATHER BUREAU, APRIL, 1909
CLIMATOLOGICAL REPORT: HAWAIIAN SECTION

WILLIAM B. STOCKMAN, Section Director.

Stations.	Districts.	Elevation, feet.	Temperature in degrees F.						Precipitation in inches.				Number rainy days.	Sky.			Prevailing direction of wind.	Observers.
			Mean.	Highest.	Date.	Lowest.	Date.	Greatest daily range.	Length of record, yrs.	Total.	Departure from the normal.	Greatest in 24 hours.		Number clear days.	Number partly cloudy days.	Number cloudy days.		
Island of Hawaii.																		
Hilo	S. Hilo	100	70.8	83	‡ 24	59	‡ 1	20	‖ 23	7.45	— 6.16	2.65	18	18	10	2	N	L. C. Lyman
Holualoa	N. Kona	1350	66.6	80	17	54	13	21	8	2.01		0.89	11	8	13	9	SW	L. S. Aungst
Honokaa	Hamakua	470	70.2	87	27	57	1	22	20	11.88	+ 5.15	3.67	7					P. V. Knudsen
Hoopuloa (Na Ohia)	S. Kona	2425	62.2	81	25	48	1	27	7	3.70		0.94	16	17	7	6	W	R. von S Domkowicz
Huehue (d)††	N. Kona	2000	66.6	78	‡ 24	57	12	19	6	1.71		0.85	11					J. A. Maguire
Humuula	N. Hilo	6685	51.2	68	26	32	1	29	‖ 3	0.40		0.11	9				NE	S. Parker, Jr.
Kapoho	Puna	110	70.7	79	‡ 1	61	15	17	18	6.78	+ 0.63	4.16	21	7	7	16	E	H. J. Lyman
Kau	Kau	1850	64.1	77	17	53	‡ 1	22	6	3.79		0.56	22	0	16	14	NE	W. H. Hayselden
Kaueleau ?	Puna	1000	67.2	78	‡ 24	55	‡ 2	21	2	7.08		1.79	28	18	8	4	NE SE	L. F. Turner
Kohala Mill	N. Kohala	270	69.8	82	18	57	15	22	14	4.91	— 0.67	1.14	12					Kohala Sugar Co.
Kohala Mission ?	N. Kohala	521	70.0	87	27	58	3	21	20	6.17	+ 0.35	1.41	13	20	4	6	NE	Dr B. D. Bond
Niulii	N. Kohala	200	70.8	81	26	59	3	15	‖ 24	7.20	+ 1.74	2.00	15	7	15	8	E	F. C. Paetow
Olaa Mill	Puna	210	71.6	84	‡ 17	59	‡ 6	22	9	9.18		4.50	21					Olaa Sugar Co
Ookala	N. Hilo	400	70.8	82	‡ 27	59	2	21	19	15.83	+ 4.17	6.30	8	22	8	0		W. G. Walker
Pahala	Kau	850	68.8	81	17	55	‡ 1	23	18	3.00	+ 0.68	0.90	14	0	30	0	E	Hawaiian Agr. Co.
Pepeekeo	S. Hilo	100	71.4	80	‡ 1	63	‡ 3	16	20	12.48	+ 2.09	6.58	22	22	6	2	E	Pepeekeo Sugar Co.
Ponahawai	S. Hilo	500	68.8	81	17	56	1	20	4	6.85		2.65	21					J. E. Gamalielson
Volcano House	Kau	4000	58.7	71	‡ 19	46	1	21	‖ 10	3.25	— 3.92	0.60	15					Volcano House
Waimea	S. Kohala	2720	65.1	75	‡ 19	50	11	20	19	1.27	— 2.16	0.20	9					Jas. McCrosson
Island of Maui.																		
Haiku	Makawao	700	69.8	82	18	57	4	21	12	4.60	— 1.88	1.16	19	3	7	20	E	D. D. Baldwin
Hana	Hana	145	71.5	84	28	61	4	16	2	4.27		1.95	16	23	0	7	NE	Geo. O. Cooper
Honomanu Valley	Hana	1800	64.2	76	9	51	4	23	5	19.31		6.45	19					W. F. Pogue
Kaanapali	Lahaina	12	73.6	87	26	60	4	22	‖ 11	0.76	— 0.21	0.61	3	18	8	4	NE	Wm. Robb
Kailua	Makawao	700	67.5	83	29	56	‡ 3	19	6	10.15		3.33	20					W. F. Pogue
Keanae Valley	Hana	1000	66.1	79	25	56	‡ 2	20	5	18.17		6.65	20					W. F. Pogue
Kihei	Wailuku	55	72.8	88	7	58	19	29	7	0.92		0.67	2	21	4	5	NE	F. H. Hayselden
Kopiliula	Hana	1220	66.0	77	‡ 15	55	4	18	5	19.61		7.09	21					W. F. Pogue
Nahiku	Hana	700	67.3	80	‡ 26	55	‡ 3	19	9	12.32		2.77	21	2	19	9	NE	C. O. Jacobs
Wailuku	Wailuku	250	71.2	85	15	59	‡ 3	24	8	4.08		1.26	8	15	7	8	NE	Brother Frank
Island of Oahu.																		
Ahuimanu	Koolaupoko	350	71.6	85	23	57	‡ 3	21	19	8.35	+ 1.65	2.10	11	16	6	8	S	H. R. Macfarlane
Ewa Plantation	Ewa	50	71.7	84	23	55	5	24	19	0.44	— 0.40	0.16	6	11	8	11	S	R. Muller
Honolulu	Honolulu	111	72.0	82	30	60	4	13	18	1.01	— 1.54	0.51	12	3	21	6	NE	U. S. Weather Bureau
Honolulu (U. S. Exp. Sta.)	Honolulu	350																Dr. E. W Wilcox
Insane Asylum	Honolulu	30	71.0	83	21	53	5	24	17	2.18	— 0.35	1.04	11	24	6	0	NE	E. Abrehamsen
Kahuku	Koolauloa	25	70.0	85	26	54	‡ 5	23	19	1.89	— 0.21	0.32	22	13	7	10	NE	R. T. Christophersen
Maunawili Ranch	Koolaupoko	250	70.3	83	‡ 20	54	5	24	15	7.97	+ 1.49	2.18	22	12	7	12		John Herd
Tantalus Heights	Honolulu	1300	66.8	77	‡ 16	56	‡ 3	18	2	5.62		2.72	19					W. M. Giffard
U. S. Magnetic Station	Ewa	45	71.8	84	‡ 23	55	5	23	8	0.70		0.31	7	4	20	6	S	Wm. F. Wallis
Wahiawa	Waialua	870	67.6	81	‡ 9	47	5	28	9	3.28		1.54	15				NE	Henry C. Brown
Waialua Mill	Waialua	30	70.6	87	27	58	‡ 4	26	9	0.94		0.24	8	10	11	9	NE	W. W. Goodale
Wainlua (Opaeula)	Waialua	1100	67.5	80	‡ 9	50	‡ 4	23	5	3.62		1.79	12	15	5	10	NE	W.W. Goodale
Waianae	Waianae	6	72.7	85	‡ 22	54	4	23	‖ 17	2.17	+ 1.46	0.70	9					Fred Meyer
Waiawa	Ewa	675		81	‡ 13				5	1.85		0.57	17	24	5	1	NE	A. Lister
Island of Kauai.																		
Kealia (d)††	Kawaihau	15	71.0	85	? 26	54	? 5	24	10	2.30	+ 0.23	0.60	8	17	13	0	NE	Makee Sugar Co.
Kilauea	Hanalei	342	70.6	84	26	53	4	26	24	2.85	— 2.15	0.80	10	14	5	11	E	L. B. Boreiko
Koloa	Koloa	241	70.7	82	26	53	6	24	‖ 22	5.61	+ 1.38	3.09	15	21	0	9	NE	Koloa Sugar Co
Lihue	Lihue	200	68.8	82	25	51	‡ 4	27	5	2.42		1.23	13	17	5	8	N	F. Weber
Makaweli	Waimea	140	72.1	82	29	56	4	22	14	2.12	+ 1.48	1.32	7	16	3	11	E	Hawaiian Sugar Co
Mana Pump	Waimea	30	72.4	87	9	53	4	26	5	0.83		0.52	4	19	3	8	N	W. Danford
Island of Molokai.																		
Kalawao	Kalawao	70	??2.4	?93	27	59	3	30	5	7.63		2.28	12	25	0	5	SE	Father Emmerau
Mapulehu Ranch	Molokai	75	71.8	83	‡ 19	60	‡ 3	19	3	3.33		2.21	11	15	9	6	NE	C. C. Conradt
Molokai Ranch	Molokai	800				‡‡54	‡ 4		10	2.50	+ 0.10	1.07	14	4	18	8	NE	G. P. Cooke

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All records are used in determining Island means, but the mean departures from normal precipitation are based only on records from stations that have ten or more years observation; the record of the current month is included in the computation of rainfall normals. ‡ More than one day. ‖ Not consecutive ? Private equipment.

†† Precipitation a full month's record. ‡‡ For 28 days.

"In Bulletin 24 of the Division of Agriculture and Chemistry, one of us in conjunction with Dr. R. S. Norris gave the results of an inquiry into the causes of the deterioration of sugars on storage. Briefly, the results then obtained led to the conclusion that deterioration was primarily to be ascribed to the action of bacteria acting in the presence of a minimum of one per cent. of water.

"During the course of the above mentioned inquiry, it became evident that certain types of bacteria were of frequent occurrence, and the necessity of determining the source of infection of the raw sugars then became an obvious problem. Before this problem could be attacked, it was necessary to isolate these types of bacteria in pure culture and to obtain their characteristics for the purpose of future investigation. This has now been done, and the present publication is chiefly concerned with an account of the characteristics of the bacteria occurring in Hawaiian sugars. Incidentally, advantage of the opportunity was taken to study the action of each specific organism on commercial sugars with reference to the effect of moisture and to the deterioration caused by each type under equal conditions.

"With the data now obtained, it is proposed, as soon as opportunity occurs, to carry on an investigation in typical factories with the object both of determining the several points of infection and of studying the effect of the various routine processes upon the distribution of bacteria in a sugar factory.

"Previous work on the deterioration of raw sugars has already correlated this source of loss with micro-organisms. Shorey* considered that moulds, including the ubiquitous *Penicillium glaucum*, were the chief factors at work. Greig Smith† ascribed the loss to one specific organism which he has described under the name of *Bacillus levaniformans*, which he isolated from a number of sugars of such various origins that he felt justified in considering its distribution as universal. This organism was in particular found by him as a constant inhabitant of juices in Australian sugar factories where it has been observed as the agent through which juices became gummy and viscous.

"Greig Smith does not consider that moulds are to be considered as a cause of the deterioration of sugars, and our work confirms his view in that moulds were but rarely found in the sugars that we have had occasion to examine.

Method of Isolation and Study.

"The organisms described in the following pages were isolated from the collection of Hawaiian sugars, the results of the study of which formed the contents of Bulletin 24 of the Division of Agriculture and Chemistry.

* Jour. Soc. Chem. Ind., XVII, 555.
† Proc. Lin. Soc., N. S. W., XXVI, 674, & Int. Sug. Jour., IV, 430.

"Preliminary tests were made to determine the relative abundance of the different bacteria in various raw sugars. A few grains of a sugar that was known to contain a preponderating number of the bacterium required was used to inoculate a dilution series of agar plates. When the last members of a series were approximately pure cultures of the particular bacterium, a further dilution was made from these and carried until only one colony developed in the last plate. From this colony a fresh series was made and if all the colonies developing proved to be identical and of the form required, it was assumed that the bacterium had been obtained in pure culture.

General Conclusions.

"The main point brought out in this investigation, is the dependence of deterioration on the influence of bacteria acting in the presence of a sufficiency of water and at a temperature favorable for their development. Consequently, if sterile sugars could be made, the chief source of harm would be eliminated. Those acquainted with the details of manufacture of cane sugar, will at once see how difficult it would be to work under aseptic conditions and with the complete absence of bacteria.

"On the other hand, any one conversant with different factories and different methods of manufacture would be able to select certain factories where a contaminated sugar or one approximately sterile would be expected; for example, a sugar resulting from a 'first-sugar and molasses' process, where the intermediate products are mostly in closed containers, and which lasts in all not more than six or seven days, would be expected to be less infected than one obtained by a process of repeated boiling in which the intermediate products are exposed in open containers for months.

Further Investigation.

"It is intended, as soon as possible, to make a bacteriological survey of a number of factories in these islands, and already, where occasion served, a little preliminary work has been carried out in a factory representing the older type of sugar house design. It was found that the raw juice contained a very large number of bacteria of which a small number survived the passage of the juice through the heaters. Those which survived this treatment were unaffected by the passage through the evaporators and pans, and appeared in the syrups and massecuites. At the centrifugals, at this factory, a very little water was used, mainly to wash down the spouts of the pug mills and also the centrifugal spindles. This was was found to contain, even in one cubic centimeter, an uncountable number of organisms, and the resulting sugar was so infected that it contained upwards of 3,000 bacteria per gram.

Infection at this point might partly be eliminated by taking steps to work here under more aseptic conditions, as by not allowing water to accumulate in the containers, by the use of none but condensed water, and by not letting water remain in the small containers used to store it at the centrifugals. It was also observed that the surface layers of all massecuite and molasses tanks contained very large numbers of bacteria, so that the re-introduction of low sugars must also be considered as a cause of re-infection.

Sugar Should be Cooled.

"The moisture and temperature conditions are also to a certain limit under control. In some factories in these islands, it is the custom to bag the sugar directly as it is discharged from the centrifugals. The bagged sugar then contains a maximum of moisture and is at high temperature, which in the interior of the bag will be maintained for some time. In the beet sugar factories on the continent of Europe, great attention is paid to a proper cooling of the sugar before placing it in the containers, and packing the sugar while hot and before it has had opportunity to part with its surplus moisture is held to be a frequent cause of subsequent deterioration.

Warehouses Should be Tight.

"At the last two meetings of the Planters' Association, storage and transportation have been very completely discussed; the dependence of sweating* on badly constructed warehouses has been clearly brought out; and the data brought forward here, showing the dependence of bacterial action on a sufficiency of moisture, should be a strong argument in favor of constructing the warehouses tight, especially in those districts where the climatic conditions are such that a damp atmosphere results.

Remedy for Sweating on Shipboard.

"In the discussions that have recently taken place, diametrically opposite views have been expressed regarding the advisability of opening the hatches or of keeping them closed during the voyage round the Horn. Cases have been quoted where sugars shipped with the hatches kept closed arrived in good condition, and again the reverse has happened. We think that the changes in tem-

* By sweating sugar we understand a sugar which has, owing to improper conditions or storage, absorbed so much water as to stain its containers. This condition is, we believe, largely determined by the nature of the adhering film of molasses, and a sterile sugar would be equally likely to sweat with one infected with bacteria. An actual deterioration, as judged by the fall in polarization, would not occur in a sterile sugar, in the light of our experiments.

perature during the voyage have a certain bearing on this question. The amount of moisture held in the atmosphere increases as the temperature rises. On leaving these islands and going south, the air in the hold reaches a high temperature. On leaving the tropics, the temperature would fall and moisture will be deposited on the sugar which will, by reason of its hygroscopic nature, take up the water and will 'sweat'; hence opening the hatches when traveling with a fall of temperature would probably allow moisture to deposit on the sugar. On the other hand, when traveling northwards, after rounding the Horn, opening the hatches would admit warm air into the hold which would then take up and carry away moisture. If the hatches should then be closed down before a fall of temperature happens, it does not seem likely that damage would ensue.

Keen Ventilator Recommended.

"At the last meeting of the Planters' Association opinions were strongly expressed in favor of the Keen ventilator. This process, we understand, maintains a current of air round the hold, but not in it. In so far as this scheme will tend to keep the hold cool and prevent the temperature rising to that degree where bacterial activity is most pronounced, we think that this scheme is likely to prove of great service. It would also be possible, we think, to extend it to the warehouses used for storage of sugars, building these with double walls, so as to allow for the circulation of a current of air between the walls and at the same time preventing the ingress of moist air during the presence of unfavorable climatic conditions.

"These considerations on transport and storage can at best be only palliative, and we are strongly of opinion that the best safeguard against deterioration is the maintenance of the factory itself in as aseptic condition as is possible, the avoidance of the introduction of bacteria, as for instance in the use of unclean water at or about the centrifugals, and the disinfection of the factory during the off season. This last method was highly spoken of by Mr. John Watt of Olaa at the Planters' Meeting of 1907 as effective in removing the causes of deterioration from a badly infected factory.

APPENDIX.

By R. S. Norris.

In the Bulletin, No. 24, of the Division of Agriculture and Chemistry on "The Deterioration of Sugars on Storage," referred to on page 5, an experiment was described which was undertaken "to determine the percentage of water which it is safe

to leave in sugars." Separate portions of a sample of moist sugar containing fermenting organisms, were dried in a vacuum so as to contain decreasing amounts of moisture from 1.86 to .29%.

The samples were polarized and put into tightly stoppered bottles. At the end of one and two months they were polarized again, and it was found that in those samples containing more than 1% of moisture, the polarizations were lower than originally.

These samples have been recently polarized again after standing twelve months, and the results further confirm the original conclusion that raw sugars containing 1% or more of moisture are liable to deteriorate on storage. The original table with the further polarizations added is given below:

	POLARIZATIONS			
Per cent Moisture.	Initial.	After 1 month	After 2 months.	After 12 months.
.29	96.8	96.7	96.7	96.5
.40	96.8	96.6	96.6	96.5
.47	96.8	96.6	96.6	96.2
.59	96.8	96.6	96.7	96.4
.65	96.4	96.4	96.6	96.2
.74	96.4	96.4	96.5	96.2
.96	96.1	96.0	96.0	95.7
1.04	96.0	95.9	95.7	95.1
1.18	96.0	95.2	95.2	94.6
1.28	95.8	95.0	95.0	94.2
1.36	95.8	95.0	94.7	94.4
1.51	95.5	94.7	94.5	93.8
1.67	95.6	94.2	94.1	93.4
1.80	95.3	93.8	94.0	92.7
1.86	95.15	94.4	94.0	93.1

Notwithstanding that the bottles were closed with rubber stoppers, the sugar was so hygroscopic that the samples had nearly all increased slightly in moisture during the year, which accounts for the lower polarizations of those containing less than 1% of moisture.

J. N. S. WILLIAMS ON THE MANUFACTURE OF NITRATE OF LIME.

Editor Planters' Monthly:

I hand you herewith a report from the Royal Society of Arts, London, England, of a lecture delivered by one of the inventors of the process now in use in Norway for the manufacture of Nitrate of Lime. This, in my opinion, is of peculiar interest to those of us who are interested in the sugar business, because, as is well known, not only do our soils require nitrogen, but also it has been recently proved that lime, added to the soil, is most beneficial. Therefore, it is apparent that a combination of nitrogen and lime in the form of a fertilizer, easily handled, would be of great benefit

to our industry. Furthermore, as the process is now perfected, there seems to be no reason why the manufacturing rights could not be obtained for this country by any enterprising corporation that had control of sufficient water power and situated adjacent to deposits of coral, either in the form of sand or reef or otherwise.

I trust you will find that this lecture will be worthy of reprinting in the Planters' Monthly.

J. N. S. WILLIAMS.

THE MANUFACTURE OF NITRATES FROM THE ATMOSPHERE BY THE ELECTRIC ARC—BIRKELAND-EYDE PROCESS.

BY HERR SAM EYDE, of Christiania, Norway.

(From Journal of the Royal Society of Arts.)

More than a hundred years ago, Priestley and Cavendish observed that the oxidation of atmospheric nitrogen took place on heating in an electric flame, and men like Sir William Crookes and Lord Rayleigh have, with others in recent years, given valuable contributions to the subject. With respect to later experiments before those of Birkeland and Eyde, which are of a more practical nature, the work which Lovejoy and Bradley have done should be mentioned as very important. Time will not admit of entering into the details of the various systems. In shortly describing the difference between previous methods and that of Birkeland-Eyde, it must suffice to say that the latter have applied large quantities of electric energy in the electric arc, and have found out the best method of doing this, while it was previously believed that it was small quantities of energy that gave relatively the best results. It is on that assumption that the apparatus employed by them was constructed. Thus the invention of Birkeland-Eyde completely revolutionized the theory of the process of atmospheric combustion.

By bringing great quantities of energy into the electric arc, and finding the most suitable electric conditions and most serviceable types of furnace, Birkeland-Eyde created the synthetical nitrate industry.

I venture here to express my belief that, however many systems may be discovered in the future, and whatever improvements any of these systems may effect, with regard either to the product or the method of production, they will all, in a greater or lesser degree, require to employ large quantities of energy in the electric arc.

In order to explain the Bikeland-Eyde method, it is necessary first to describe the flames, consisting of arcs of light, which are used in the electric furnaces.

The formation of the flame occurs through an arc of the electric

flame being formed between the points of the electrodes, which are close to each other. By this an easily movable and flexible current is established, which, with the arrangements made, will be found in a highly magnetised field. The electric arc that has been formed, moves on account of this magnetic field with great velocity perpendicularly to the lines of force, and the electric arc's foot draws back from the points of the electrodes. When the length of the electric arc increases, the electric resistance becomes greater and the tension increases, until it becomes so great that a new electric arc starts from the points of the electrodes.

To regulate the current, an inductive resistance is used in series with the flame. With alternating current, all these arcs are formed in opposite directions and appear to the eye to be circular dics. It appears that we have discovered in this flame a powerful technical means for the oxidation of the nitrogen of the air. The flame in our furnaces burns with a steadiness that is really astonishing.

On electrodes of 1.5 cm. thick copper tubing, through which water passes for cooling them, one can take up over 1,500 horse-power, with a flame of 1.8 m. in diameter. The chamber in which the flame burns is circular, of only a few centimetres width, and about 2 metres diameter. After the oxide of nitrogen is formed in the furnace, it is converted in the oxidation tank into dioxide of nitrogen, and in the absorption towers into nitric acid.

From furnaces no larger than could be held in the hand, and which took an energy of some few horse-powers, we have attained to types which can, as mentioned, take an energy of more than 1,500 horse-power, and from absorption apparatus of glass globes of a few litres capacity, to absorption towers of granite with a capacity of 600 cubic metres each. We have in the course of this period of developing our method had four experimental stations. The first attempts were made at Frognerkilens factory in 1903. As we could not obtain more than 20 kilowatt of electric energy there, the experimental station was removed in October, 1903, to a building of our own on Ankerlökken, with power from the Christiania municipal electric power station, and, to obtain still more power, to Vasmoen, near Arendal, and later to Notodden.

THE FURNACE HOUSE.

The building in which the furnaces are placed has a floor surface of about 2,000 square metres. It is entirely constructed of masonry and iron. In the basement are tubes for admitting the air and others for carrying off the gas. The power from our station at Svælgfos is brought in by 18 copper wires, each 12 millimetres in thickness. When these have been brought into the furnace house, they pass through oil-cooled current converters. In order to be able to supply each furnace with the amount of

power desired, each is furnished with an induction coil, by means of which the power is regulated as required. The induction coil serves, moreover, to make the flame in the furnace steady and even while working. Of the 36 furnaces installed, 32 receive their power from Svælgfos and 4 from Tinfos power station.

The flame chamber of the furnace is formed of fire-clay brick, through the walls of which the air is conveyed to the flame. The nitrous gases formed in the flame escape through a channel made along the casing of the furnace, which, like the flame chamber, is furnished with fireproof lining.

With this furnace we have achieved such steady working, that it burns for weeks without any regulation worth mentioning. It may further be stated, that the maintenance of the furnace and its repair are simple to a degree, as the most exposed portions, the electrodes, only require to be changed every third or fourth week, and the fireproof masonry every fourth to sixth month.

The temperature in our flames exceeds 3,000 or perhaps 3,500 degrees Centigrade. The temperature of the escaping gases may vary between 800 and 1,000 degrees during ordinary working. The furnaces are made of cast steel and iron, the middle of the furnace being built out to a circular flame chamber. The electrodes are led radially into this flame chamber. By aid of centrifugal fans, the air is brought into each furnace through tubes from the basement.

When the air in the flame chamber has been treated by the electric flames, the nitrous gases formed pass out through a channel built along the casing of the furnace and thence out through the lower part of the furnace to two fireproof-lined gas-collecting pipes, about 2 metres in diameter, which convey the gas through the basement out to the steam boiler house. In the boiler house the gas passes through four steam boilers, in which the temperature, which was, as mentioned, 1,000 degrees Centigrade, is reduced. The heat given off by the gas is used for concentrating the products, and in the winter time for warming the factory buildings.

The steam produced in the boilers is utilized in the further treatment of the products. In the boiler house there are also two large and two small air compressors, which supply compressed air for pumping acids and lye in the factory's various chemical departments.

The gases pass on from the steam boilers through an iron pipe into the cooling house, with the object of completing the cooling commenced in the steam boilers. This cooling is necessary in order to obtain a suitable absorption. Each cooler consists of a great number of aluminium tubes, over which cold water runs, while the hot gases pass through them. The temperature of the gas is considerably reduced. From the cooling chambers the gases go on to the oxidation tanks.

These oxidation tanks are vertical iron cylinders, lined with

acid proof stone. The object is to give the cooled gases a sufficient period of repose, in which the oxidation of the oxide of nitrogen may have time to take place. The necessary amount of oxygen is present in ample quantity in the air which accompanies the gases from the furnaces. From the oxidation tanks, the gases are led into the absorption towers. All the towers are filled with broken quartz, which is neither affected by nitrous gases, nor by nitric acid. To assist the passage of the gases on their way from the furnaces, there are centrifugal fans, constructed of aluminium, on each row of towers.

The gases enter at the base of the first tower, go up through the quartz packing and thence by a large earthenware pipe enter the top of another tower through which they pass downwards through the quartz at the bottom of the third tower, and so on, until the air, relieved of all nitrous gases, leaves the last tower. Water trickles through the granite towers and this is gradually converted into a weak nitric acid, while the liquid used in the wooden towers is a solution of soda. The absorbing liquid enters the top of the tower and is distributed in jets by a series of earthenware pipes, so that the permeating gases come in immediate contact with the absorbing liquid. In the granite towers nitric acid is thus formed, and in the wooden towers a solution of nitrate of soda.

The liquid emerges in a constant, even stream from the bottom of the towers, that from the granite towers running into a granite cistern. Hence it flows into the "montejus" which serve to pump up the acid, which has to pass repeatedly through the tower before it has become strong enough for the purpose for which it is intended. The "montejus" are of stoneware strengthened with iron shields, are worked by compressed air, and send the acid up into large stoneware jars. From these jars the acid again runs through the towers as described. The "montejus" work automatically. The wooden towers are percolated, as already mentioned, by a solution of soda, otherwise the whole process is practically similar to that in the granite towers. The solution of soda, owing to its far greater power of absorption, effects the separation of the last remains of nitrogenous gases from the accompanying air. Of the entire quantity of nitrous gases passed through the absorption system, about 97 per cent. is absorbed. The finished nitric acid coming from the towers, which has a strength of about 30 per cent. by volume, is collected in granite cisterns, from which it is drawn to what is called the "dissolution works." These consist of granite vats filled with limestone, over which the acid is poured. This drives off, with violent effervescence, the carbonic acid contained in the limestone, while the nitric acid takes its place and forms a watery solution of nitrate of lime or calcium nitrate. This solution of nitrate of lime is now pumped into vacuum evaporating apparatus.

The object of boiling in vacuum is the well-known fact that great saving is thereby effected in the heat required.

The steam required for the evaporisation is obtained from the steam boilers, heated, as before mentioned, by furnace gases. The concentration of the nitrate solution in the evaporising plant is continued until the specific weight of the liquid at a given temperature shows a content of 13 per cent. of nitrogen. This solution is then sufficiently evaporated, and can be pumped up into the solidification chambers. These are fitted with shallow iron pans, under which cold air is pumped to accelerate cooling. After some time, the nitrate stiffens into a brittle, crystalline mass, hard as stone. This is broken up into lumps, and is taken into the crushing machines. These consist of ball crushing mills, which reduce the mass to a granular state. The coarse powder so produced is raised by elevator to a vat, from the bottom of which it is tapped into casks holding 100 kilos net weight.

The barrels are made at our own coopers' shop and are lined with paper to guard against damp. The color of the product depends on the limestone used in the manufacture. The nitrate of lime is used in various chemical works as well as for manure, the only difference being that, for the former purpose, the product is not ground fine, but is run direct in the liquid state into thin iron drums, in which it stiffens into a solid mass.

THE MANUFACTURE OF NITRITE.—NITRITE OF SODA.

It now remains only to mention the further treatment of the nitrite formed in the alkaline towers. When this is pumped away from the towers, it contains, besides nitrite and water, also some nitrate of soda, and bi-carbonate.

The further process is designed to separate the pure nitrite from the other substances. This is accomplished by first boiling away some of the water, which is done, as in the case of the nitrate solution, by steam from the steam boilers, heated by the furnace gases. The nitrite solution, concentrated to a suitable boiling state, is run into crystallization pans, in which the crystallization of the nitrite takes place. The crystals are separated by centrifugal means and are conveyed by a screw transporter to a drying apparatus, where they are subjected to a current of hot air. The finished product is then run into casks containing 300 kilos each. These are likewise made in our own shops. This nitrite of soda is used as the raw material in the manufacture of certain kinds of aniline colors. The manufacture of nitrite is carried on in a special building.

In the entire process of manufacture, both of nitrite and nitrate, no coal is used; all the machinery is worked by electric power, and for heating and evaporating the nitrate and nitrite solutions, the only steam employed is that obtained by the hot gases passing through a system of steam boilers.

We are, moreover, in our industry, not confined to the two products hitherto mentioned, nitrate of lime and nitrite of soda, we have possibilities for the development of a whole series of new industries, of which I will specially name the production of nitric acid, nitrate of ammonia, nitrate of potassium and others.

We have succeeded, in conjunction with the Nobel (nitroglycerine, etc.) Syndicate in concentrating our weak acids, by means of gases from our furnaces, to acids of a high percentage which can be transported.

AGRICULTURE.—TRIALS WITH NITRATE OF LIME.

In recent years a number of well-known men and institutes connected with agriculture have undertaken numerous experiments for the purpose of testing the effect of the nitrate of lime under various climatic and other conditions and on various kinds of soil. These trials have been made in Norway, Sweden, France, Germany, Austria-Hungary, Italy, and also in the United Kingdom.

All the experiments have fully confirmed the expectation which was held forth by men of science when this new manure first appeared, viz., that one pound of nitrogen in the form of nitrate of lime has the same effect, both in quality and quantity, as a similar amount of nitrogen in the shape of nitrate of soda, or, in other words, that nitrate of lime is equal to nitrate of soda as a manure.

At times, variations may be observed one way or another, in one case in favor of the nitrate of soda, in another in favor of nitrate of lime. But especially in soils deficient in lime, the nitrate of lime has proved superior.

A number of agricultural chemists have conducted pot-experiments to compare nitrate of lime with nitrate of soda. I may name amongst others: Professor Sebelin, the College of Agriculture, Aas, Norway; Dr. E. Solberg, head of the Agricultural Experiment Station, Trondhjem, Norway; Professor Söderbaam, Sweden; Professor Paul Wagner, Darmstadt, Germany; Professor Th. Schloesing, Jr., Paris, and Mr. James Hendrick, chemist of the Highland Society of Scotland.

They all affirm that the nitrate of lime has proved to be fully equal to nitrate of soda as a manure, as long as the same quantities of nitrogen are employed. Professor Wagner adds, that the nitrate of lime is preferable on soils that are deficient in lime.

The field experiments are of still more practical importance, and a number of such have been made in various places in different countries. Especially extensive and exact field experiments have been made in the Scandinavian countries.

Norway.—Professor Bastian R. Larsen, conductor of experiments at the Norwegian College of Agriculture, has, from 1904 to 1908, carried out a series of the most careful experiments to compare nitrate of soda with nitrate of lime.

Several parallel trials have been made each year, some on the college grounds, some on land in various parts of the country.

Putting the results for ordinary manuring with nitrate of soda at 100, the results for similar manuring with nitrate of lime have been:

Potato crop 1904	146.3
" " 1905	100.9
" " 1906	97.1
" " 1907	109.3
" " 1908	100.0
Green fodder on marsh land, 1906	106.1
Top dressing on meadow, 1908	100.3

The professor concludes with the words:

"The experiments referred to appear, on the whole, to demonstrate that the nitrogen in nitrate of lime is equally valuable as the nitrogen in nitrate of soda."

Denmark.—In Denmark a series of experiments has likewise been carried on for the purpose of comparing nitrate of soda with nitrate of lime. The Sealand Farming Associations have carried out 37 different trials on a number of farms. Putting the results for ordinary manuring with nitrate of soda at 100, the results of nitrate of lime are:

Experiments with—	Grain.	Straw.
Rye (1907)	100.5	101.0
Oats (1907)	103.3	100.5
Barley (1907)	99.9	98.4
" (1908)	99.7	104.1
		Roots.
Beetroot (1907)	....	97.0
" (1908)	....	98.8
Sugar-beets (1907)	....	101.1
" (1908)	....	96.6

Nitrate of lime has thus in some instances been a little below nitrate of soda, in others a little above.

Sweden.—The Director, Herr P. Bolin, gives the following account of local farm trials (practical cultivation trials) made by the Hushallnings Association in Sweden.

Putting (as before) the effect with nitrate of soda at 100, the results with nitrate of lime were:

	Grain.		Straw.
Experiments with oats in 1904	104.5	....	118.0
" " " 1905	137.5	....	100.0
" " " 1906	105.0	....	93.4
" " hay, 1906	....	100.9	....

In these experiments nitrate of lime proved considerably superior to nitrate of soda.

The director states respecting a number of experiments with roots in 1906: "Apart from some irregular instances the experi-

ments made with roots appear to confirm the observations which have previously been made by ourselves and others."

The United Kingdom.—The average results of three trials of nitrate of lime with oats made by Mr. James Hendrick, chemist of the Highland and Agricultural Society of Scotland, has been:

		Yield per Acre.		
		Grain.	Straw.	
		lbs.	cwt. qr.	lbs.
1.	No manure	2,348	33 0	21
2.	Phosphate and potash only	2,532	37 1	6
3.	Same as 2 with nitrate of soda	2,774	41 3	1
4.	Same as 2 with sulphate of amm	2,774	41 3	24
5.	Same as 2 with nitrate of lime	3,121	43 1	13

In these experiments nitrate of liem proved considerably superior to nitrate of soda.

Experiments with oats at the West of Scotland Agricultural College by Professor R. Patrick Wright.

AVERAGE OF TWO TRIALS.

	Yield per Acre.				Ratio.	
	Grain.	Straw.			Grain.	Straw.
	lbs.	T.	cwt.	qr.		
Experiments of 1907—						
Nitrate of soda	1890	1	12	3	100	100
Nitrate of lime	2040	1	10	1	108	93
Experiments of 1908—						
Nitrate of soda	2777	2	1	3	100	100
Nitrate of lime	3121	2	3	1	117	107

In both the instances here quoted, nitrate of lime has thus shown itself to be superior to the nitrate of soda as a manure for oats, when the same quantity of nitrogen is employed, especially when the chief object is the weight of grain.

Experiments on roots at University College, Reading, by Professor John Percival:

		Yield.	
1.	Nitrate of lime, 1½ cwt. per acre	37	tons
2.	Nitrate of soda, 1½ cwt. per acre	36	"
3.	Sulphate of ammonia, 1½ cwt. per acre	32.5	"
4.	No manure	27.75	"

It should here be observed that the largest crops have been obtained with the use of nitrate of lime, even when the same gross quantities have been employed, notwithstanding that the nitrate of lime only contains 13 per cent. nitrogen against 15 per cent. in nitrate of soda and 20 per cent. in sulphate of ammonia.

EXPERIMENTS MADE BY PROFESSOR B. W. BULL, OF THE ESSEX EDUCATION COMMITTEE.

Mangold Experiments, 1908.

		Tons.	Cwt.
1.	Dung, Superphosphate and Nitrate of Lime	29	12.8

2.	Dung, Superphosphate and Nitrate of Soda.....	28	3.6
3.	Dung, Superphosphate and Sulphate of Ammonia....	26	7

A Trial of Slag, as a Spring Application.

		Tons.	Cwt.
1.	Dung, Superphosphate and Nitrate of Lime.....	22	15.7
2.	Dung, Superphosphate and Nitrate of Soda.....	21	18.7
3.	Dung, Superphosphate and Sulphate of Ammonia....	19	2.1

SVAELGFOS POWER STATION.

Svælgfos power station is about four and a half kilometers, barely three English miles, from Notodden factories, on the Tinn river, which, by the regulation of the Lakes Tinnsjoen and Mosvand, has been brought up to a constant supply of seventy-five cubic metres of water per second.

The power station consists, in its main features, of a weir or dam, by which the water level has been raised seventeen metres (about fifty-six feet).

A tunnel leads the water to the basin, whence it passes through four channels through the rock and lined with iron to the four turbines.

The effective height of the fall is forty-six and a half metres—nearly one hundred and forty English feet.

There are four turbines installed, each of from ten thousand to eleven thousand seven hundred and fifty horse-power, thus, under normal circumstances, yielding forty to forty-five thousand turbine horse-power.

The turbines are fitted with two wheels, to which the generators are coupled. The number of revolutions is two hundred and fifty per minute. They are constructed by the firm of Voith in Heidenheim.

The generators were built by the Allmänna Svenska Electriska Aktiebolag, Vesteras, are three-phased current machines, with fifty periods per second, six hundred ampères per phase, and a tension of ten thousand volts, delivered directly upon the line.

The power is conveyed to Notodden by three transmitting cables, each of six wires, and a fourth cable will shortly be added in order to utilize the power more completely.

The power station is erected in the bed of the river itself close in under the almost perpendicular western bank, and all materials had to be lifted by cranes, fifty metres up or down. The heavy portions of the machinery were carried over to the power station by the aid of a very powerful earial ropeway, stretched from the road to the east side of the river to the edge of the precipice.

This power station is of considerable interest, not only as being the largest water-power station in Europe, but on account of the plant there installed being doubtless the largest in the world at the present moment.

SQUIBS.

Cane reaping operations were commenced in the Carib country of St. Vincent this year. The land in question, which includes many fertile estates, has been practically abandoned since the volcanic eruptions of 1902, and this is the first sugar crop that has been obtained for seven years past.

The Board of Agriculture and the Agricultural Society of Jamaica, acting in accordance with suggestions from the Government, have appointed a committee to consider the question as to what steps (if any) should be taken to encourage cotton growing in the island, more especially among small settlers.

A great decrease in the number of sugar factories in France has been noticeable for many years past. Thirty years ago there were 535 factories in working; these have successively declined to 375 in 1888, 292 in 1906, and 255 in 1907, the lowest total for fifty years. The decrease is attributable in a great measure to the transformation of refineries into distilleries, the production of alcohol being more remunerative than that of sugar.

The fluctuations in the price of rubber that occurred during the year 1908 are described by the *India Rubber Journal* as having constituted a record. In January, 1908, the market price of fine hard Para rubber was 3s. 2d. per pound, but declined in February to 2s. 9d. per pound, the lowest figure reached in the year. The highest price of the year—5s. 4¾d. per pound for fine hard Para was reached in November, and at the close of the year the price stood at 5s. 2d. per pound.

Hawaii is again getting ahead of us. Her pineapple canneries are taking up the matter of making guava jellies, paste, and the canning of the various native fruits so that they can use their canneries all the year round. This is certainly a rich field for development.—*Porto Rica News.*

The woodlands of Jamaica are not confined to any particular parts of the island; in each parish except certain portions, such as fertile plains and valleys, and suitable grazing lands, woodlands occupy rather extensive areas, the total at present being estimated by the Surveyor General at 400,000 to 500,000 acres, or about one-sixth of the island. This estimate, however, does not include scrub-lands.

The area of Japan is about 94,000,000 acres, of which only 12,778,124 acres, or 13.53 per cent. was under cultivation in 1905. The popualtion was 47,812,702, and as Japan is practically a self-sustaining people, the whole nation secures its subsistence and

other necessaries on an area of 0.267 acre per head. Japan is a country of small holdings. Farms below 2 acres formed 55 per cent., those between 2 and 3¾ acres 30 per cent., and those above 3¾ acres 15 per cent., the average for the country at large being 2.55 acres.

Probably in no other country in the world are agricultural associations so general and so well organized as in Japan. Recently there were in existence 58,547 associations in 47 prefectures, 638 counties, and 13,509 towns and villages.

Beet sugar factories in the United States number sixty-eight. Of these three are closed. Only one new factory is being erected for the season of 1909-10. This is at Santa Ana, Southern California. The machinery is second-hand, being removed from Wiarton, Ontario.

In Canada there are only three beet sugar factories.

The beet sugar factories in the United States are located as follows: In California 10; Utah 5; Idaho 4; Colorado 16; Nebraska 2; Wisconsin 4; Michigan 17; Washington, Montana, Arizona, Oregon, Kansas, Iowa, Minnesota, Ohio, Illinois and New York, each one.

MEXICO.—Work has been started on the buildings for the government agricultural station, located on the hacienda, San Miguel, near the City of Oaxaca, Mexico, in the richest sugar cane lands in the State. The buildings will cost about $225,000. An experimental sugar mill has been erected, which will be run by electricity. The Ejutla railroad passes through the hacienda. One of the objects of the station is to teach the scientific manufacture of sugar.

The average factory of Louisiana consumes from eight to twelve gallons of oil per ton of cane at a cost of about 2½ cents per gallon; or, in other words, a factory grinding about forty thousand tons of cane will consume from ten to fifteen thousand dollars of fuel oil each year, besides its bagasse, which only furnishes about two-thirds of the fuel. During the past campaign just ended one particular factory operated on 4.2 gallons of oil per ton, which was about the best record made in the State.

The imports into the Philippines during 1908 amounted in value to $29,186,000, in addition to material imported for the use of the government.

The exports in 1908 amounted to $32,601,000 in value, the principal articles being: Hemp, $16,501,956, of which $7,797,926 went to the United Statesffi copra, $6,058,886, of which $220,892 went to the United States; sugar, $5,703,641, of which $1,996,166 went to the United States; copra, $6,058,886, of which $220,892

of which none went to the United States; manufactures of tobacco, chiefly cigars, $1,117,286, of which $18,748 went to the United States.

FOREST POLICY OF THE PENNSYLVANIA RAILROAD.

The Pennsylvania Railroad is planning to set out this spring more than 1,000,000 trees. This will make a total of 3,430,000 trees which have been planted in the last three years to provide for some of the company's future requirements in timber and cross-ties. This constitutes the largest forestry plan yet undertaken by any private corporation.

Heretofore the company's forestry operations have been confined to a limited area between Philadelphia and Altoona. This year, however, 65,000 trees are being set out on tracts of land near Metuchen and New Brunswick, N. J. In addition, there are to be planted within the next month 207,000 trees near Conewago, Pa., 186,000 in the vicinity of Van Dyke, 334,000 at Lewistown Junction, 7,000 at Pomeroy, and 205,000 at Denholm.

The bare places in the locust-tree plantations, which were started some years ago, are being filled in with new seedlings, in order that these may follow as a second growth after the older trees have been removed for fence posts and other purposes. Of the trees that are to bet set out this spring, 83,000 are red oak, 40,000 Scotch pine, 29,000 locust, 14,000 hardy catalpa, 14,000 pin oak, 5,000 European larch, 3,000 chestnut, 3,000 yellow poplar, 2,000 black walnut, and 1,000 white pine.

The policy of encouraging reforestation on the part of the public has been actively pursued this spring. Some 151,000 trees have been furnished, practically at cost, to private corporations and individuals. In addition, 8,000 privet hedge plants have been supplied to private individuals. Privet hedge plants to the number of 7,000 are to be set out to ornament boundary lines along the company's right of way.

A special effort has been directed this season to growing ornamental shrubbery for use in parking the lawns around stations and unoccupied spaces along the roadway. To save the time required to grow these from seed, 6,000 plants have been imported from France. They will be placed in beds, at the company's nursery at Morrisville, N. J. Part of them will be ready for transplanting next year, and the remainder in 1911.

Indicative of the scope of the forestry plan of the company this year is the fact that at the Morrisville nursery alone, approximately 1,250,000 trees have been dug, bundled, and shipped to places along the railroad. The area occupied by these trees has been plowed, fertilized, and is to be replanted with about 200 bushels of acorns. Half a million coniferous seedlings, which

were grown last year, are being set in transplant beds to remain for a year before being set out permanently. In addition to the above, there will be planted this spring about 100 pounds of pine and spruce tree seed, which should produce about a million plants. These in time will be transplanted in permanent locations.

FOURTH DRY FARMING CONGRESS.

The Fourth Dry Farming Congress will hold its meeting at Billings, Montana, October 26, 27 and 28, 1909. This will not only be an institute for dry farming farmers and dry farming instructors and teachers, but it will be an exposition of dry farming products such as this or no other country has ever witnessed. There are pledged already exhibits from thirteen western states that are engaged in dry farming work. The organization by states, to show what each is doing and capable of doing in the raising of grain and vegetable crops, without irrigation, is a feature never before undertaken in this district and promises some great surprises for visitors.

The Dry Farming Congress will be a good place to visit next October, in view of getting dry farming information and dry farms on which to put it into practice. The Dry Farming Congress announces that there are 200,000,000 acres of arable land awaiting development by the dry farming methods.

THE USE OF FORMALIN TO CARRY OVER JUICE IN CASE OF SHUT DOWN.

J. Louis Blouin, well known in Hawaii, has contributed an article to the Demeter monthly magazine published by the Louisiana State University, on certain sugar manufacturing conditions in Louisiana. It appears to us that the most important point covered relates to procedure with juice when a shut down of the mill takes place.

He says: "When a stop of any time from twenty-four to thirty-six hours is required, do not keep steam on the house until all the thin juice is boiled up, but preserve them in clean tanks with formaldehyde or formalin, and the loss of sugar is insignicant."

No Hawaiian sugar mills grind on Sunday. They shut down on Saturday night and do not begin grinding again until Monday

morning. So far as we know the almost universal custom is to boil off on Saturday night. This, of course, uses up, in many cases, the surplus bagasse, resulting at some mills in the necessity for using outside fuel on Monday morning. Even when outside fuel does not have to be used, the available supply of bagasse is so diminished that a lower degree of masceration takes place than would be the case if fuel were plentiful. Less maceration means a lower extraction.

Some few mills have bagasse to throw away under any circumstances, but many of them would be ahead of the game if they could save the fuel used up in boiling off on Saturday nights, besides the general cost and added wear and tear of working several hours over time.

The use of formalin for carrying over the juice during shut downs should be thoroughly investigated and tested. It may be that some Hawaiian planters have already tested the proposition. If so, the Planters' Monthly would be glad to hear from them as to what the results are, for the benefit of planters who have not yet tried it.

CONSUMPTION OF SUGAR IN THE UNITED STATES.

The total annual consumption of sugar in the United States, the percentage of increase or decrease year after year, and the per capita consumption for the years 1884-1907 are shown in the table which follows. The total consumption has increased nearly 140 per cent., while the per capita consumption has increased over 52 per cent. since 1884.

CONSUMPTION OF SUGAR IN THE UNITED STATES FOR TWENTY-FOUR YEARS, 1884-1907.

[According to Willett & Gray.]

Year.	Total amount sugar consumed. Tons.*b*	Increase (+) or decrease (—).*a* Per cent.	Consumption per capita. Pounds.
1884	1,252,366	+ 7.01	51.00
1885	1,254,116	+ 0.14	49.95
1886	1,355,869	+ 8.11	52.55
1887	1,392,909	+ 2.74	53.11
1888	1,457,264	+ 4.62	54.23
1889	1,439,701	— 1.21	52.64
1890	1,522,731	+ 5.77	54.56
1891	1,872,400	+22.96	67.46
1892	1,853,370	— 1.02	63.76
1893	1,905,862	+ 2.83	63.83

1894	2,012,714	+ 5.55	66.64
1895	1,949,744	— 3.13	64.23
1896	1,940,086	— 0.49	60.90
1897	2,070,978	+ 6.75	63.50
1898	2,002,902	— 3.29	60.30
1899	2,078,068	+ 3.75	61.00
1900	2,219,847	+ 6.83	66.60
1901	2,372,316	+ 6.87	69.70
1902	2,566,108	+ 8.17	72.80
1903	2,549,642	— 0.64	70.90
1904	2,767,162	+ 8.53	75.30
1905	2,632,216	— 4.88	70.50
1906	2,864,013	+ 8.81	76.10
1907	2,993,979	+ 4.54	77.54

a As compared with the preceding year. *b* Tons of 2,240 pounds.

CONSUMPTION OF SUGAR IN EUROPE.

Mr. F. O. Licht estimates the per capita consumption of sugar in European countries as follows:

EUROPEAN PER CAPITA CONSUMPTION OF SUGAR FOR THE YEAR 1906-7.

	Pounds.		Pounds.
Germany	40.92	Portugal and Madeira	15.51
Austria	24.32	England	93.50
France	36.05	Bulgaria	7.98
Russia	20.55	Greece	10.16
Holland	41.40	Servia	6.92
Belgium	29.70	Turkey	11.73
Denmark	73.68	Switzerland	55.22
Sweden and Norway	47.88		——
Italy	7.63	All Europe	31.61
Roumania	7.83	United States	77.54
Spain	11.37		

The foregoing table shows that the United States consumes more sugar per capita than any other nation except England, the consumption in this country being about two and a half times as much as for Europeans in general.

THE WHOLESALE GROCER AND FREE SUGAR.

A committee of wholesale grocers has been formed with headquarters at 138 Fort street, New York, with the avowed purpose of assisting in obtaining cheaper sugar for consumers through the reduction in the duty on raw and refined sugars. This committee has recently issued a circular in which it refers to the fact that public sentiment in all sections of the country as indicated by the

press and by the immense number of petitions sent to Congress, is strongly in favor of a lower tariff rate on sugar. It charges that the Sugar Trust has more weight with the law makers than the 80 millions of consumers who want and are entitled to cheaper sugar, and, further, it says that the action of the Committee on Ways and Means in refusing to reduce the sugar duty, was taken in the face of the fact that Mr. Claus A. Spreckels of the Federal Sugar Refining Co., testified that the sugar refining industry needed no protection, provided raw sugar was placed upon the free list.

CIRCULAR IS DISINGENUOUS.

The whole circular is so disingenuous that it cannot mislead anyone familiar with the sugar industry, but may mislead those who are not familiar with it and who may be prejudiced against the Sugar Trust. The fact of the matter is that in the proposed tariff bill the Sugar Trust is not protected whatever, excepting in two parts. All refined sugars, whether of high or low test, and whether of good or of inferior quality, as well as all sugars above No. 16 Dutch Standard, are placed in a class by themselves with a discriminating duty against them of 12½ cents per hundred pounds, which becomes prohibitive generally. The Payne tariff bill proposes to reduce this 12½ cents to 7½ cents per hundred pounds, thus cutting that discriminating duty in favor of sugar refiners nearly one-half.

ATTACK IS ON SUGAR PRODUCER.

From these data we may see that this committee of wholesale grocers, reaching as it does, as indicated by its personnel, from New York to San Francisco and from Chicago to Birmingham, is quite representative in its character. Its attack upon the Sugar Trust can hardly be sincere and the attack, in fact, is upon the entire domestic sugar industry of the United States, which is protected by the sugar schedule, excepting for the restricted discriminating duty hereinabove stated.

REFINERS' INTEREST SMALL.

Most people seem unaware and, it is possible, that this committee is unaware of the fact that the interest of the sugar refiners in sugar is not very great. They are now buying sugars at 3¾ to 4 cents per pound, melting and refining them and turning them out at from 90 cents to $1.00 per hundred pounds higher price, this 90 cents to $1.00 per hundred pounds covering the entire cost of manufacture, the loss in weight in the process of buying 100 pounds of 96 test sugar and turning out 100 pounds of pure white 100 test sugar, and the cost of coöperage and shipment. This

entire expense, or investment, that they make for refining any sugar amounts on their own statement and on the statement of those familiar with the industry, to but 50 cents per hundred pounds and all above that becomes to them net gain, affected only by the fixed charges of the business. On this 50 cents they have a prohibitive discriminating protective duty of 12½ cents per hundred pounds. The domestic sugar producer who sells his sugars to the sugar refineries at 3½ to 4 cents per pound has invested in them the entire 3½ to 4 cents, or 100 per cent. of the selling price, and not 50 cents per 100 pounds the cost of manipulation only, as in the refiners' case. It is manifest, therefore, that the domestic sugar producer who plants his sugar cane, or his sugar beet seed in the ground and turns out therefrom final sugar at 3½ to 4 cents per pound and who is now doing this in the United States to the extent of about 800,000 tons of sugars per annum and in Hawaii and Porto Rico to the extent of over 600,000 tons additional, are the parties interested in the protective duty on sugars and the attack of the wholesale grocers is upon the sugar producers in effect, although it is alleged to be against the sugar refiners.

NOT IN INTEREST OF CONSUMERS.

We are not so seriously concerned with the argument of the committee of wholesale grocers, excepting for its lack of accuracy in its preliminary statements that it is made in the interest of the consumers. This is manifestly untrue and its action is certainly in the interest of the wholesale grocers, as if successful it will require less capital invested in sugar to carry on their business than now. If they can sell white sugars in this country at 3 cents per pound, instead of 5 cents, they would have less money at risk and would doubtless have an increased demand for sugar, but would simply destroy the domestic sugar industry. The same line of reasoning applied to any manufactures, of cotton, woolen, linen or silk, would destroy any of these industries and looking at the whole matter from this point of view we can readily see that the sudden development of affection on the part of the wholesale grocers of the country for the consumers of sugar is insincere. They are simply looking out for themselves and if all the business interests of the country were broken up into little coteries warring upon each other, the United States would not have reached that magnificent commercial, manufacturing and financial development that it has attained during the last forty years.

COST AND PROFITS OF GROWING SUGAR BEETS.

The U. S. Department of Agriculture has issued a Bulletin concerning Beet Sugar production in the United States. The following are extracts therefrom:

The cost of growing an area of beets depends on so many varying factors as to render it impossible to give an estimate which is reliable for every locality. The differences in rent of land, cost of labor, methods of culture, etc., require that any estimate which may be given should be revised for almost every series of conditions. The following estimate of the cost per acre, made several years ago when wages were somewhat lower than at present, is based on a yield of 12 tons per acre, except in Utah, where the yield was placed at 15 tons.

An assumed yield per acre is requisite in estimating the cost of harvesting, etc., since a part of the cultivation and the harvesting are often contracted at a certain price per ton of beets. The figures given below are from actual averages or from estimates by experienced men.

Estimated cost per acre of sugar-beet culture.

Items.	California.	Utah.	Nebraska.	Michigan.
Clearing the land	....	....	$1.00 to 1.50	$2.25
Plowing and harrowing	$5.37	$3.50	2.50 to 3.00	
Seed and seeding	1.80	2.75	3.25 to 3.85	2.50
Bunching and thinning	14.40	4.00	7.00	7.00
Hoeing		4.00	2.00 to 4.00	4.00
Cultivating		2.00	1.50 to 1.60	1.50
Other expenses	....	a1.50	.....	....
Harvesting and delivering	b1.50	c15.00	11.00 to 13.20	17.20
Total	23.07	32.75	28.25 to 34.15	34.45
Cost of siloing when necessary	....	....	2.50 to 8.00	....

In the above estimate was included the cost of the best culture, but nothing for rent of land or a reasonable application of fertilizers. It is probable that the actual cost to our farmers for the first few years of the beet industry did not exceed $25 to $35 per acre and in many instances fell below these figures.

It is reasonably certain, accidents of season aside, that a net profit of from $8 to $15 per acre may be expected from the proper culture of the sugar beet in localities near a factory when all the conditions of the best methods of culture are fulfilled.

a Cost of irrigation.
b Exclusive of delivery.
c Based on a yield of 15 tons per acre.

For comparison with the above estimate there are given in the following table the actual figures submitted by a Colorado farmer, as published in The American Sugar Industry and Beet Sugar Gazette of June 20, 1907, and also those given by a Wisconsin farmer and a Washington farmer in the same journal for April, 1908.

Reported cost of sugar-beet culture in three actual cases, and the net returns.

Items.	Colorado.	Wisconsin.	Washington.
Number of acres planted	5	11	11
Plowing, harrowing, leveling	$ 8.75	$34.85	$24.00
Seed	12.30	39.00	26.70
Drilling	2.25	6.40	4.00
Thinning	22.75	60.00	66.00
Hoeing	10.25		30.50
Cultivating and ditching	9.00	27.50	17.50
Irrigating	3.50	.....	.....
Total cost	$71.05	$167.75	$168.70
Average cost per acre	14.21	15.25	15.34
Cost of harvesting and delivery	.....	218.00	133.15
Total average cost per acre	$27.00	$ 35.07	$ 27.44
Number of tons of beets harvested	.....	135	115
Amount received for beets	.....	$695.00	$607.00
Average receipts per acre	.....	63.18	55.18
Net returns per acre	.....	28.11	27.74

In none of these estimates have the rent of the land or interest on capital been considered. It is not wise to underestimate the actual cost of growing the beets, for this will lead the farmer to expect large profits, which often in practice give way to actual deficits.

VALUATION OF BEETS AT THE FACTORY.

In the purchase of beets for sugar making the factories offer the growers either a "flat rate" or a "sliding scale." In case the former system is adopted, the factory offers a uniform price of $4.50 or $5 per ton for all beets which reach or exceed a certain minimum standard of quality, as, for instance, a sugar content of 12 to 14 per cent., with a purity of 80. In case beets which fall below this standard are offered, the factory may make a reduction in the price or refuse the beets, but no extra price is paid for beets which exceed the standard requirements. If the "sliding scale" is adopted, the factory offers a minimum price of say $4 or $4.25 for beets which reach a minimum standard of quality, as, for instance, 12 per cent. sugar with a purity of 80, and makes an extra allowance per ton of 25 to 35 cents for each per cent. of sugar in excess of the established minimum. Under

this system beets of extra fine quality may bring $5.50 per ton or even more. Some factories buy all their beets at a flat rate, others buy only according to a sliding scale, while many offer the farmers their choice between the two systems.

In determining the quality of the beets a sample is taken from each load delivered. The percentage of sugar is determined either directly from the beet or from the expressed juice. If from the juice (which is the usual method), the percentage of sugar in the beet is calculated from that in the juice.

According to a United States Census report on the manufacture of beet sugar in 1905, the average prices paid for beets were as follows:

Prices per ton paid for beets in 1900 and 1905 compared.

State.	1905.	1900.
Colorado	$5.28	....
Michigan	5.52	$4.38
California	4.72	4.47
Wisconsin	5.36	....
All other States	5.19	4.26
Average for the United States	$5.22	$4.39

A comparison of these figures shows that there was a large increase in the price of beets during this five-year period.

ELECTRICITY AND PLANT GROWTH.

In the May Planter an account was given of an experiment on a considerable scale, of the effect of electricity on plant growth, showing remarkably favorable results. Almost every month brings forth reports of similar results at different points. The March Washington, D. C., Experiment Station Record contains a review of experiments carried on by J. E. Newman.

Five hundred square yards of kitchen garden were electrified by the overhead discharge system. The yields as compared with the control plats showed that cucumbers gave a gain of 17 per cent. and strawberries from 36 to 80 per cent. Upon tomatoes there appeared to be no effect. An outbreak of a bacterial disease of cucumbers seemed much lighter upon the electrified plants.

In another experimental plat, carrots showed 50 per cent. increase, and beets 30 per cent. increase of crop with an increase of 1 per cent. in sugar content.

In 1906, 20 acres of wheat were electrified with discharge wires at a considerable height and with a high tension current. In this case an increase of from 29 to 30 per cent. over the control areas was recorded, and the electrified wheat is said to have given a better baking flour and commanded a higher price.

The author carried on some laboratory experiments to test the nature of the electrical acceleration of plant development, but no satisfactory clues were arrived at.

SUGAR CONDITIONS IN BRITISH GUIANA.

The Demerara Argosy publishes a summary of the sugar conditions in British Guiana, which contains several items of interest to planters in Hawaii.

LABOR CONDITIONS.

The statement is made that the most serious drawback to the sugar industry of the colony is the scarcity of labor, "rendering it impossible to get tillage operations attended to in due time and retarding reaping and manufacturing operations."

The main source of labor supply of the colony is East India, from which country indentured laborers are recruited at the rate of 1,200 to 2,000 per annum.

During the 1908-9 immigration season four ships arrived from India with 1,729 adults. The number of immigrants introduced during the four preceding seasons was:

	Adults.
1907-08	1,677
1906-07	2,053
1905-06	2,417
1904-05	1,207

During 1908 one ship conveyed to India return immigrants equal to 775 adults. These immigrants took with them money and jewelry to the value of $37,877.

The total East Indian immigrant population of the colony is now estimated at 133,000 souls, and of this number about 70,000 are resident on the sugar plantations, including close on 10,000 immigrants under indenture.

The applications for immigrants to be allotted season 1909-10 will be in the neighborhood of 3,000. The absence of a sufficient supply of labor on the sugar plantations is being more and more felt year by year.

It is somewhat difficult to understand why there is a scarcity of labor with 70,000 Indians actually living on the plantations, and only 71,000 acres under cultivation, unless there is an abnormally large number of women and children.

AREA CULTIVATED.

The land under cane cultivation during 1908 extended to 71,000 acres, exclusive of about 2,000 acres cultivated by cane farmers.

The total empoldered area of the sugar estates extended in round figures to 160,000 acres, of which 71,000 acres were under canes, 11,000 acres under rice, and 2,000 acres under ground provisions, etc., the balance being made up of pasture savannah and abandoned lands, a good deal of the latter being unsuited for cultivation of any kind.

During the year there were 42 plantations under cultivation on which sugar was manufactured, including plantation Windsor Forest, which was thrown out of sugar cultivation towards the end of the year. The plantations under cultivation may be grouped as under as regards acreage:

Over	7,000	acres	1
"	3,000	"	4
"	2,000	"	6
"	1,000	"	20
Under	1,000	"	11

The largest area under cultivation on one plantation was 7,151 acres, and the smallest 533 acres.

EXPORTS.

The exports of sugar for 1908 amounted to 110,657 tons, as against 99,207 tons for 1907.

The quantity of sugar unshipped on 31st December, was 17,000 tons, as against 20,000 tons at the close of 1907. The quantity of sugar used for local consumption is roughly estimated at 7,500 tons.

The rum export amounted to 2,188,336 gallons, as against 2,107,129 gallons for the year 1907.

The quantity of molascuit exported was 7,932 tons, a smaller quantity than the 1907 export, which reached 10,378 tons.

THE PATHFINDER DAM.

By C. J. Branchard, *Statistician, U. S. Reclamation Service.*

The completion of the Pathfinder dam, one of the highest structures of its kind in the world, is the event which the people of Wyoming and Nebraska are now celebrating. Resting on a bed of solid granite, and hewn from the vertical walls of the same formation through which the North Platte River has cut its channel, a massive masonry monolith closes the canyon. It rises 215 feet above its foundation, and is 500 feet long on top. But the real significance of the event is that it marks the most important step in the reclamation of large tracts of the Great Plains area in

both states, and their transformation to thickly settled farming communities, with numerous populous and prosperous towns and villages.

The North Platte River drains an area of 90,000 square miles, carrying the run-off of a large mountainous territory. Fed by the melting snows of spring and early summer its volume swells to large proportions, but in the late summer it shrinks to a small stream, distributed over a wide stretch of shifting sands. Every drop of the low water flow has long been appropriated, and the conservation of the flood waters of the river was beyond the reach of private capital. It was for the purpose of storing the flood and winter waters and controlling the flow of this irregular river that the great dam just completed was planned.

Behind the massive wall of masonry a million acre-feet of water will be stored each year, and the destructive floods of the North Platte River, which annually have caused damages far in excess of the cost of the dam, will never again visit the valley.

The North Platte Irrigation Project is one of the largest so far undertaken by the Government. From the Pathfinder dam at a point on the North Platte River about fifty miles southwest from Casper, Wyo., to the farthest limits of the irrigable land in Nebraska, the distance is fifty miles, and it is estimated that 400,000 acres of land in Wyoming and Nebraska, or more than double the total area of land cultivated in the entire state of Rhode Island, will be divided into small farms and irrigated.

The comparison afforded by the following table, showing the dimensions, cost and effectiveness of the Pathfinder and three large eastern dams, is most interesting:

Dam	Height in ft.	Length in ft.	Contents in cu. yds.	Cost	Storage capacity acre feet
Pathfinder ..	215	500	60,400	$ 1,200,000	1,025,000
Wachusett ..	228	971	273,000	2,226,000	192,000
New Croton.	297	1,072	833,000	7,631,000	92,000
Ashokan ...	220	*4,800	†7,900,000	12,700,000	368,000

It will be seen that the Pathfinder dam, which cost only $1,200,000, has a storage capacity more than ten times that of the New Croton which cost six times as much.

One hundred miles from the storage dam a low diversion dam has been thrown across the river, which turns the waters into the Interstate Canal, to supply lands in Wyoming and Nebraska. This canal when completed will be 150 miles long, but at present only ninety-five miles have been excavated. It has a capacity at the headgates of 1,400 second-feet. Hundreds of miles of

* Masonry, 1,000 feet, and earthwork, 3,800 feet.

† 900,000 cubic yards masonry and 7,000,000 of earth.

laterals have been constructed to distribute the water over the lands.

Under the terms of the Reclamation Act all of the land under this project which belongs to the public domain is open to entry under the homestead law in farms of about eighty acres. Each settler is required to pay his share of the cost of building the irrigation works. This amounts to $45 per acre, payable in ten annual installments without interest.

TEN YEARS OF PROGRESS IN CUBA.

All reports from Cuba, of which some, from sources of unimpeachable trust-worthiness, have been published in our news columns, agree in giving a satisfactory account of the present position and future prospects of the island. In the judgment of so competent an observer as Mr. Alfred H. Smith, the general manager of the New York & Cuba Mail Steamship Company, a change has come over the country which will result in developing in Cuba a rate of progress equal in all respects to any in the Western Hemisphere. Mr. Smith admitted that whatever might have been his ideas before making his recent tour of the island he was now convinced of the stability of Cuba's government. A statement like this is doubly satisfactory because of the doubts which have been cast from time to time on the ability of the Cubans to govern themselves. It was from the first the policy of our government to place the conduct of local affairs in Cuban hands, and this was made the subject of very severe criticism by authorities presumably well informed.

It was on the first day of January, 1899, that the whole of the Island of Cuba passed into American hands. Summing up the results of the first year of occupation, Major J. E. Runcie said that he found the courts corrupt and incompetent; the police force hopelessly inefficient; the public schools unorganized; the municipalities bankrupt dependents on the political machine; the offices of government very largely filled by unworthy and incompetent officials; the laws, the courts and the methods of procedure unreformed, and, finally, almost every abuse against which Cubans had rebelled and to remedy which the United States had intervened, in active operation under American authority. He declared that there existed throughout the island a condition of tame anarchy, which awaited only the withdrawal of the American forces to burst out into anarchy of another type.

When as the result of the political overturn in Cuba in August, 1906, with the threatened destruction of foreign property which attended it the United States was again forced to intervene under the authority conferred by the Platt amendment there were those who saw a fulfillment of the prophecy of 1900. The insurrection

did unquestionably stop all agricultural work at a critical period and destroyed confidence sufficiently to make a serious interference with the planting of sugar for the crop of 1908. These conditions happened to be followed by a severe drouth during the following summer, whereby the sugar crop of 1908 was reduced to 925,000 tons, against 1,420,000 tons in the previous year. And yet there comes the statement today that along the lines of railway in Cuba substantial towns are springing up, great warehouses are being built and everything points to constantly increasing shipments of sugar and other products. The export of iron ore continues to increase, and bananas are likely to be sold abroad in constantly growing quantities.

Then there is the new industry of cattle raising, which particularly attracted Mr. Smith's attention, and led him to conclude that before long Cuba would be exporting extra fine beef cattle to the United States. This latter item bears out the prediction of another sympathetic observer made over a year ago that while up to that date few or no cattle had been raised for export purposes, the time was at hand when the fruit of American enterprise would be visible in this direction. It was then estimated that there was a milion and a quarter head of cattle in the island, representing a value of $40,000,000, of which at least three-fourths was American capital. In point of fact this branch of investment by Americans was as large as that represented either in the sugar or the tobacco interests of Cuba and was somewhat in excess of the amount of American money which had gone into railways.

Even the most pessimistic of the early critics of American administration in Cuba found two branches of the public service in which there had been a great and satisfactory advance from the previously existing conditions. The receipts from the Custom Houses quickly increased in spite of the reduction in trade due to the exhausted condition of the island and the reductions made in the tariff rates. Then, also, in the Department of Sanitation and Public Health, where American control was absolute and no Cuban was permitted to interfere, the result was seen in the lowest death rate ever known in the island. But these triumphs were cited to reinforce the argument that Cubans might be trusted to follow the old Spanish methods and to employ them for their own ends and not for the public good with the result of palpable administrative failure.

In short, it was assumed that unless Americans were allowed to work with American methods and to admit of no interference from native sources the result would be disastrous. Hence, the argument of so fair-minded a man as Mr. Edwin F. Atkins, of Boston, presented as recently as September last, that Cuban independence could only mean economic disturbance. Mr. Atkins pointed out that when in the early spring of last year it was announced from Washington that the United States troops would be withdrawn not later than February 1, 1909, further credit was

refused to the planters, imports fell off and general stagnation followed. These were the conditions which he found prevailing in early fall and he attributed this state of things to the fact that there were very few people connected with the business of the island, even among the Cubans themselves, who believed that the country was prepared for an unrestricted independent government, free from any form of United States control. Yet today everything points to constantly increasing shipments of sugar and other products and thoroughly capable observers combine in expressing their high satisfaction over the immediate prospects of Cuba in an administrative no less than in a commercial sense.—N. Y. Journal of Commerce, April 12.

LAW TO CREATE MUNICIPAL FORESTS.

A forward step of vast significance in the utilization of forest lands adjacent to cities in Pennsylvania has been taken by the passage of a bill entitled "An act to permit the acquisition of forest or other suitable lands by municipalities for the purpose of establishing municipal forests and providing for the administration, maintenance, protection and development of such forests."

The bill, as presented, is at the suggestion of the American Civic Association, which has made the subject of the preservation of forests one of its great activities. Legislation of the character contemplated by the Pennsylvania bill is new to the United States, but not new to European countries, Germany in particular. Municipal forests in that country have been acquired and developed during a period of many years. They have been more than an addition to park systems—they have been a source of revenue to the municipalities maintaining them. The same results would be accomplished by the application of the municipal forest idea in America.

The extent to which Germany has recognized the value of its forests is illustrated by the fact that in the single province of Baden, of its 1,564 communities, 1,350 own their own forests and in addition 287 corporations, such as schools, churches and hospitals, possess forest land. From an aggregate of 7,342,944 acres in the states these local corporations are allowed to cut yearly 261,724,300 board-feet of timber and wood, with a net value of about $3,600,000.

The city of Baden alone owns 10,576 acres, from which it has derived a net income of $66,079.68, or $6.25 per acre, all of which goes to the general fund for the maintenance of the municipality.

The Pennsylvania law makes possible similar returns for its townships, boroughs, and cities, the control of the forests thus acquired to be directed by the commissioner of forestry of the

commonwealth. What Germany can do the United States ought to equal and exceed, notwithstanding the fact that Berlin is proposing at the present time to expend $10,000,000 in the acquirement of forests.

Of this law Dr. J. T. Rothrock, Consulting Forester for Pennsylvania, says: "I regard it as one of the most important forestry measures that we have secured in this state. It cannot fail of good results. We are indebted to the President of the American Civic Federation, more than to any other one man, for its introduction and passage. It involves no expenditure of state funds and there is no reason why it should not lead to like enactments in every other state, and every reason why it should."

MANUAL ON DRY FARMING.

A most important addition to the agricultural literature of the world has just been issued by the Dry Farming Congress in the form of a "Handbook of Information" which contains the official report of the proceedings of the third sessions of the organization which was known as the Trans-Missouri Dry Farming Congress prior to the convention at Cheyenne, Wyo., last February. This report is a comprehensive review of the work of the Congress and contains, in addition to the addresses and papers delivered before the convention at Cheyenne, the complete report of Statistician W. H. Olin, in which a review of the actual results of dry farming throughout the world is given, together with suggestions and recommendations to dry farmers.

The contents of the book are conveniently classified and indexed so that any reference to any subject relating to dry farming may be found without delay. The book, issued as a handbook of information for farmers is sent without extra charge to the members of the Congress in good standing and may be purchased for one dollar a copy by others interested in the subject. It is published by the Dry Farming Congress which will hold its fourth sessions and the Second International Exposition of Dry Farm Products at Billings, Montana, October 25-29, 1909.

Those who desire the handbook may send $1 to Secretary John T. Burns of the Congress for membership. The members receive not only the handbook but the semi-monthly Dry Farming Congress Bulletin, the only official "dry farming" newspaper published in the world.